INDIA ELECTRICITY DISTRIBUTION REFORM REVIEW AND ASSESSMENT

VOLUME I: MAIN REPORT

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Submitted By

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ACRONYMS

AcCs	Advisor-cum-Consultants
ADB	Asian Development Bank
AP	Andhra Pradesh
APDP	Accelerated Power Development Program
APDRP	Accelerated Power Development and Reform Program
APL	Adaptable Program Lending
BEE	Bureau for Energy Efficiency
BIS	Bureau of Indian Standards
BSES	Bombay Suburban Electricity Supply Company
CERC	Consumer Education Research Center
CII	Confederation of Indian Industries
CoP	Chief of Party
COTR	Contracting Officer's Technical Representative
CPRI	Central Power Research Institute
CRISIL	The Credit Rating Information Services of India Ltd.
CRM	Customer Relations Management
DCA	Development Credit Authority
DFI	Development Finance Institution
DPR	Detailed Project Report
DISCOM	Distribution Company
DR	Distribution Reform
DSCE	Debt Service Coverage Ratio
DSM	Demand Side Management
E3	Office of Energy, Environment, and Enterprise
ECA	Energy Conservation Act
ECO	Energy Conservation Commercialization Project
ESCO	Energy services company
FI	Financial Institution
FIRR	Financial Internal Rate of Return
GDP	Gross Domestic Product
GEF	Global Environment Facility
GEP	Greenhouse Gas Pollution Prevention Program
GHG	Greenhouse Gas
GIS	Geographical Information System
GoI	Government of India
GW	Gigawatt
HT	High Tension
HVAC	Heating, Ventilation, and Air Conditioning
IBRD	International Bank for Reconstruction and Development
IC	Institutional Contractor
ICICI	Industrial Credit and Investment Corporation of India, Ltd.
IDBI	Industrial Development Bank of India
IDFC	Infrastructure Development Finance Corporation

IFCI	Industrial Finance Corporation of India
IL&FS	Infrastructure Leasing & Financial Services, Ltd.
IPP	Independent Power Producer
IR	Intermediate Result
IREDA	Indian Renewable Energy Development Authority
KPTCL	Karnataka Power Transmission Corporation, Limited
kV	kilovolt
kWh	kilowatt-Hour
LOE	Level of Effort
LT	Low Tension
MoA	Memorandum of Association
MP	Madhya Pradesh
M&V	Measurement and Verification
MNES	Ministry of Non-Conventional Energy Sources
MoP	Ministry of Power
MW	Megawatt
NGO	Non-governmental Organization
NPC	National Productivity Council
NTPC	National Thermal Power Corporation
OECF	Overseas Economic Cooperation Fund
PASA	Participating Agency Services Agreement
PFC	Power Finance Corporation
PGCI	Power Grid Corporation of India
PMP	Performance Monitoring Plan
PMU	Project Management Unit
PROAG	Project Grant Agreement
PSA	Procurement Services Agent
R&D	Research and Development
REC	Rural Electric Corporation
SBI	State Bank of India
SEB	State Electricity Board
SERC	State Energy Regulatory Commission
SGM	Sustainable Groundwater Management
SO	Strategic Objective
SOAG	Strategic Grant Agreement
TA	Technical Assistance
T&D	Transmission and Distribution
USAID	U.S. Agency for International Development

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I. EXECUTIVE BRIEF

Background

The U.S. Agency for International Development (USAID) Mission in India is preparing a project consistent with its recently approved new strategy for the period FY 2003-2007 aimed at helping India accelerate and complete its developmental agenda of poverty alleviation. A key component of the new strategy involves supporting power sector reforms, specifically distribution reforms (DR) to address core sector issues of poor financial performance, high T&D losses, low energy efficiency, and adverse environmental impacts. In order to advance India's power sector distribution reform, the USAID Mission plans to initiate a new activity -- The Distribution Reform (DR) Project -- that will provide the means for addressing the technical, commercial, and attendant social issues through the planning and execution of selected model pilot projects that will test and validate best practices in reform. USAID engaged the services of CORE International to conduct a review and assessment of the distribution reform in India and submit a report on its findings on the DR problem in the country. The Electricity Distribution Reform Review and Assessment Report completed by CORE International (Two Volumes -- Volume I: Main Report and Volume II: Annexes) provides an in-depth review of the magnitude and seriousness of the electricity distribution problem in India and documents current and planned reform initiatives. The Report also provides sample analyses to illustrate the differences between urban and rural distribution and the need for very different approaches for electricity distribution reform and efficiency improvements for the two sectors.

The Problem

India's power sector is characterized by inadequate and inefficient power supply. While installed power capacity has increased from a meager 1362 MW to over 100, 000 MW in the fifty-five years since the country's independence, consumers are confronted with frequent power cuts, and fluctuating voltages and frequencies. In addition, system losses are high throughout India's transmission and distribution (T&D) networks. In 1992 - 93, the total financial losses attributable to T&D losses stood at Rs. 4,600 crore ($920 million). These losses reached an estimated Rs. 26,000 crore, in 2001, more than US $5 billion per year. At the rate of this trend, the Montek Singh Ahluwalia Committee Report on Securitization of SEB Loans has estimated that the financial losses of the sector will exceed Rs. 45,000 crore (US $9 billion) per year during the next three years. In addition to these enormous direct losses, the indirect losses in terms of lost productivity and trade, sagging economic activity, rapidly shrinking of domestic and foreign investment in the sector, uneconomical and misallocated investments in captive power, and reduced income generation could be many-fold.

The recently released "Distribution Policy Committee Report" by the Ministry of Power (MoP) stresses that any solution to India's distribution reform problems should be multi-faceted, one that combines technical interventions with commercial practices, corporate governance, regulatory reform, social marketing, policy reform, and political commitment. The MoP has introduced the Accelerated Power Development and Reform Program (APDRP) with the sole objective of rapidly improving the financial performance of the Indian power sector. Central to APDRP is the reduction of distribution energy losses in the most vulnerable parts of the distribution network. Three key components in the APDRP are (i) inclusion of specific distribution reform measures through Memorandum of Association (MoAs) negotiated with individual States, (ii) expansion of the program coverage beyond the initially selected 63 distribution circles to include all 454 distribution circles throughout the country; and (iii) extensive capacity building of the State Electricity Boards (SEBs) and the distribution companies (Discoms) through provision of training and technical assistance by the various Advisor-cum-Consultants (AcCs).

The distribution losses in India's power sector occur on both sides of the energy meter – the utility side as well as the consumer side. On the utility side, the main causes for the f energy losses are non-standard and antiquated distribution engineering practices, inefficient and overloaded distribution equipment, faulty and poor maintenance practices, a lack of investment in system upgrade, faulty meters, and poor commercial management and accounting practices. At the consumer end, the problems leading to avoidable energy and revenue losses are lack of meters, prevalence of flat rate tariffs over metered tariffs, non-payment, theft, illegal connections, a lack of consumer education in the rural sector, rampant political interference, and inefficient electricity use.

Analysis and Approaches

An in-depth analysis conducted by CORE International confirms that the power distribution problem in the country is a multi-dimensional one. There are clear technical problems indigenous to the distribution system. Likewise, there are also economic, social, and political dimensions to the problem that need to be addressed. From a strategic standpoint, therefore, any solution must necessarily target the issue of high T&D losses and marry it with technical, economic, social, and political remedies in concert. The Assessment Team's analysis concludes that rural distribution projects are very different from urban projects and will likely require a substantially different approach for distribution reform. The rural sector is very different from the urban sector mainly due to differences in consumer profile, rural energy end-use practice, flat tariffs, a lack of meters and collections, a lack of institutional infrastructure, political interference (particularly in the farming sector - a large user of energy for pumping), and a lack of consumer education and participation in electricity distribution. Given all these differences,

rural electrification suffers from two syndromes -- (i) a constant need for subsidy, and (ii) a lack of interest by the private sector due to inherent investment risks.

In order to further elucidate the complexities of urban and rural distribution, the Assessment Team evaluated a number of urban and rural distribution reform projects that are being planned by some of the Discoms and private sector entities. Based on this evaluation, the Team's analysis confirms that for urban area distribution reform projects, the payback period is generally less than 4 years for most of the cases considered. Hence, these projects can be financially viable. However, in the rural area/circles, most distribution reform measures, when implemented as a package, would yield payback periods much higher (2-3 times than that for urban projects). Also, the range for investment per unit of energy input and investment per unit of energy savings is about 3-5 times of that for urban projects.

Therefore, the Team has documented this urban/rural difference in order to provide USAID a more informed basis for developing its interventions and defining activities to support India's distribution reform initiatives.

The USAID Mission in India proposes to identify, prepare and co-finance the modernization of selected urban and rural distribution circles, sub stations, and feeders in power sector reforming states such as Karnataka, Andhra Pradesh, Rajasthan, Uttar Pradesh, and Madhya Pradesh. These distribution circles will serve as models of excellence and permit the showcasing of efficient technologies, systems, and business practices. A special feature of the activities being contemplated by USAID is its focus on enhancing customer relations and overall utility efficiency improvement in both the urban and rural sectors. In the case of rural pilot projects, USAID plans to include the role of village level communities, co-operatives, and private entrepreneurs in managing the business of rural power distribution.

Viable distribution systems are dependent on the state-level regulatory and policy environment and the impetus received through centrally driven programs such as the APDRP. By the same token, the experience gained and the lessons learned through the implementation of a targeted distribution reform initiative by USAID would assist the Indians in designing and implementing viable reform projects in various urban and rural distribution circles. USAID can also be instrumental in helping informed regulatory policy formulation at the state and central levels.

In view of the need to adopt a holistic and strategic approach towards distribution reforms, the Team conducted a detailed assessment of the distribution problem and potential opportunities for reform. Based on the Team's assessment, it appears that any intervention to affect reform in India's power sector should follow a strategic framework that targets well designed interventions at various levels.

A conceptual framework could include potential interventions at three levels – the central government, the State Electricity Boards or DISCOMs, and individual distribution circles or feeders.

An Illustrative DR Intervention Approach

The Team feels that an illustrative intervention approach to accelerate distribution reform in India could include targeted interventions within three inter-related components as follows:

1. Component 1: National Distribution Reform Strategy and Alternative Financing
2. Component 2: State Distribution Reform Planning
3. Component 3: Distribution Circle Pilot Project Replication and Outreach

While any interventions under Component 1 and Component 2 may be primarily in the form of policy planning and innovative financing, the fundamental thrust of the interventions needs to be under Component 3 aimed at demonstrating best practices in distribution reform. Thus, a new activity could embody a number of successful pilot urban and rural projects with the aim to (i) influence the overall distribution reform policies and programs at the national level, and (ii) introduce proven commercial practices for distribution management at the state utility level.

A well designed intervention through a new USAID activity could result in a number of accomplishments, the most notable of which are mentioned below:

- Increased utilization of APDRP funds and leveraging of USAID investments towards distribution circle modernization in selected reform states
- Reduction in State fiscal deficit as a result of reduced subsidies to cover SEB operating losses
- Creation of alternative financing windows in Indian DFIs (e. g. PFC, IDFC), and other institutions for urban and rural distribution projects in order to provide long-term debt and/or credit enhancement guarantees
- Passage of anti-theft legislation in the State parliaments
- Introduction of accounting and management practices and fiscal discipline and best practices for commercial operations of SEBs and Discoms
- More effective social outreach and stakeholder participation resulting in educated costumers and, thus improved collections
- More self sustained systems through implementing successful rural electrification models such as consumer cooperatives, producer cooperatives, franchises, and NGOs

- Gains in energy efficiency as well as water use efficiency through extensive consumer education and social outreach

On an aggregate basis, any new activity designed by USAID should aim to achieve benefits both at the individual pilot project level and in accelerating the distribution reform process in India widely through the potential replication of the pilot projects. To a substantial extent, the true success of any distribution reform initiative is closely linked to the political will and the institutional commitment of the leaders and managers in India. Given the severe financial crisis in the power sector and unattainable energy and financial losses, the government does not have many options except to promote distribution reform in an aggressive and sustained manner. The entire culture of electricity distribution and the role of participating central and state level stakeholders need to be changed.

II. BACKGROUND

This section briefly reviews the current status of the power sector in India, its experience with sector reforms, the proposed distribution reform priorities of the Government of India (GoI), and the ongoing and proposed USAID initiatives to participate with the government in the overall sector reform process with an emphasis on power distribution. This discussion provides the context of both the GoI's reform priorities as well as strategic channels for potential USAID intervention to assist various central entities within the GoI, State Governments, the State Electricity Boards (SEBs), and the newly created distribution companies (Discoms). It also describes other participatory models at the state and consumer levels in advancing power sector reform, specifically distribution reform.

A. THE POWER SECTOR

India, demographically, is the second largest country in the world with a power sector, which has an installed capacity of over 100,000 MW and serves about 80 million customers. As per the Indian constitution, the power sector is in the "concurrent list" implying thereby that the responsibility for its management falls jointly under the central and state governments. The legal and regulatory basis for the management of the sector is derived from several basic Acts -- (i) the Indian Electricity Act (1910); (ii) the Electricity Supply Act (1948); and, (iii) the Electricity Regulatory Commissions Act (1998). In addition, an Electricity Bill (2001) has been introduced with the objective to integrate various elements of the government's power sector reform priorities. The 1998 Electricity Regulatory Commissions Act includes specific provisions for the establishment of independent electricity regulatory commissions (ERCs) at the central and state levels.

The Ministry of Power has estimated that throughout the decade of the 1990s, India was in need of an additional 10,000 MW of new capacity in order to meet its electricity demand. During 2000 - 2001, the total energy shortage was estimated at 39,816 million units and the peak shortage was estimated at 10,157 MW (approximately 13 percent of the country's installed capacity). At the state level, the peak shortage was as high as 30 percent in many cases, resulting in both scheduled and unscheduled power outages. Given this chronic shortfall, in 1991, the Government of India opened up the power sector for private investments in new generating capacity. Over the past decade, the government aggressively pursued international Independent Power Producers (IPPs) in order to mobilize investor interest in investments in the country's power sector. In spite of various incentives offered by the government, private investment did not occur at the anticipated levels for a variety of reasons. The most critical inhibitor to private sector investment in India's power sector throughout the 1991-2000 period was, and currently continues to be, a lack of security for investment recovery. , Poor

management practices are ingrained in the SEBs, especially in collections, performance monitoring, and operational control. Under-investment in distribution assets, inadequate renovation and maintenance, excess manpower, and poor fiscal discipline are all too common. As a result, they have entered a vicious cycle of under-investment, and are unable to attract capital to improve operational performance.

In the transmission and distribution (T&D) sector the problems have continued to increase with the net result of huge recurring sector losses. In 1992 - 1993, the total financial losses stood at Rs. 4,600 crore. These losses in 2001 reached an estimated Rs. 26,000 crore, more than US $5 billion per year. At the rate of this trend, the Montek Singh Ahluwalia Committee Report on Securitization of SEB Loans has estimated that the financial losses of the sector will exceed Rs. 45,000 crore per year during the next three years.

A recent white paper on Power Sector Reforms prepared by McKinsey & Company with the Confederation of Indian Industry (CII) suggests that if the productivity of the Indian power sector is brought up to its demonstrated potential, the sector can be restored to financial health without removing current subsidies or increasing prices. The report specifically targets T&D, where the opportunities for improving efficiency and improving productivity are significant. In the case of metering, the report estimates that the one-time cost of installing meters at all un-metered customer locations in India would be approximately Rs. 30 billion ($600 million). This cost is only a fraction of the cost of power theft , approximately Rs. 120-150 billion each year ($ 2.4 billion-3.0 billion).

Any new investments in new generation capacity by either the government or the private sector will only be feeding a massively leaky bucket. Furthermore, lack of cost recovery discourages investment. The GoI has, therefore, placed its highest priority in reducing these massive distribution losses through an aggressive power sector reform program. Significantly, the GoI has recognized the need to accelerate the pace of reforms in the country at various levels, and that the reform process needs to go one level further below the state utility level to the levels of individual distribution circles and possibly even at the feeder levels in many cases. Perhaps, most critically, there is a clear recognition that the States need to be aligned around a reform agenda that must include an explicit commitment to distribution reform.

B. GOI POWER SECTOR REFORM INITIATIVE

As part of its focus on power sector distribution reform, in February 2000, the GoI instituted a new scheme -- Accelerated Power Development Program (APDP). The primary focus of the APDP was to initiate a sustainable process aimed at significantly improving the financial performance of the SEBs. The specific objectives of the APDP scheme were to select and finance targeted projects in the following areas: (i) rehabilitation, modernization, and life extension of

outdated and inefficient power plants; (ii) upgrading and strengthening of sub transmission and distribution networks (11 kV, 22 kV, and 66 kV); and (iii) programs to assist SEBs and Discoms in implementing modern and efficient methods for metering, billing, and collections to improve revenue collection.

Among the three components of the APDP, the emphasis continues to be on the upgrading of sub-transmission and distribution networks and on revenue enhancement measures. Starting in fiscal year 2001 - 2002, the APDP program was expanded and renamed as the Accelerated Power Development and Reform Program (APDRP), largely based on the need for GoI to link the disbursement of the APDRP funds with specific reform measures at the state level. Three key enhancements in the APDRP are (i) inclusion of specific distribution reform measures through Memorandum of Association (MoAs) negotiated with individual States, (ii) expansion of the program coverage beyond the initially selected 63 distribution circles to include all 454 distribution circles throughout the country; and (iii) extensive capacity building of the SEBs and Discoms through provision of training and technical assistance by the National Thermal Power Corporation (NTPC) and Power Grid Corporation of India (PGCI), two Advisor-cum-Consultants (AcCs) selected by the GoI. Annex I includes a more detailed description of the APDRP scheme.

The proposed APDRP scheme hopes to address these problems through providing financial support to the SEBs and the Discoms linked to specific reform measures. The APDRP Cell within the MoP has designed a reform performance document and is currently negotiating with a number of states specific reform measures to be introduced as a condition of assistance under the APDRP program. Specific examples of reform measures under discussion between the APDRP Cell and the distribution utilities include (i) technical efficiency improvements, (ii) development, privatization, financing, and implementation of reform projects, (iii) administrative and managerial capacity building, and (iv) implementation of management changes to shift the current operations of the distribution utilities to gradually increasing commercial orientation. Specifically the MoP is seeking commitments from the State governments and the State-owned utilities to introduce commercial methods and concepts such as accountability and transparency, stakeholder input, design of upfront subsidies, and the design of incentive/penalty systems for the operations at the distribution circle and even the feeder levels. Implicit in this approach is for the utilities to begin introducing approaches so that the distribution circles are managed as a business with both financial accountability and service accountability to the consumer. Annex I provides more details on the GoI APDRP Scheme.

C. USAID AND OTHER INITIATIVES

A number of activities have a significant bearing on and potential relationship to the USAID's desire to support India's distribution reform effort. These include, USAID's E-cubed office activities under its project portfolios; multilateral and

bilateral activities; and, GOI activities including those led by private sector distribution utilities and financing institutions. Annex II provides a summary description of USAID's current power sector activities in India and includes selected other donor initiatives.

III. DISTRIBUTION REFORM ASSESSMENT

A. BACKGROUND

The USAID Mission is planning to design a new activity consistent with its recently approved new strategy for the period FY 2003-2007 aimed at helping India accelerate and complete its developmental agenda of poverty alleviation. A key component of the new strategy involves supporting power sector reforms, specifically, distribution reforms (DR) to address core sector issues of poor financial performance, low energy efficiency, and adverse environmental impacts.

USAID/India recognizes that the major inefficiencies in the electricity distribution sector inhibit a more rapid and comprehensive reform of the energy sector throughout the country. The constraints imposed by the tariff subsidy and inefficiency issues in the distribution sector are well documented, but the solutions have been difficult to pursue, and carry with them a wide variety of social and political implications. As a result, the Mission plans to design a new USAID program activity in Distribution Reforms (DR) that will provide the means for addressing the technical, commercial and attendant social issues through the development and execution of selected pilot projects that will test and validate best practices in power sector reform. USAID plans to strategically apply targeted amounts of investment and technical assistance and training to demonstrate best practices and show the way forward in sector reform.

As part of the new activity USAID proposes to identify, prepare and co-finance the modernization of selected distribution circles, sub stations, and feeders in power sector reforming States such as Karnataka, Andhra Pradesh, Rajasthan, Uttar Pradesh, and Madhya Pradesh. The distribution circles/sub stations/feeders will be selected in consultation with the APDRP Cell within the MoP and the state power authorities (energy departments/ministries and Discoms). For the selected distribution circles, sub stations, and feeders, USAID proposes to assist the Discoms in preparing the necessary pre-investment and feasibility studies. The detailed project feasibility studies will analyze methods to improve the sub-T&D systems utilizing best practices in technical, commercial, and financial management of power distribution that could be adapted to Indian conditions. These studies will also focus on (i) opportunities in advancing end-use energy efficiency and demand-side management (DSM) applications, (ii) real time energy accounting and auditing, (iii) MIS systems, (iv) power supply monitoring and control, (v) low-loss distribution system engineering designs utilizing GIS-based information mapping systems, (vi) distributed generation, (vii) agricultural DSM, rural co-operatives and committees, in-farm water/energy co-management, and (viii) other interventions aimed at distribution loss reduction and improving cost recovery.

This assessment report documents the extent of the distribution problem in India and discusses illustrative models and approaches to assist the GoI in accelerating its distribution reform through targeted interventions. The report concludes that the best intervention will very likely be at the distribution circle level where not only the problem is the greatest, but so is the opportunity to affect reform and replicate best practices across the various states in India. The distribution circles can serve as models of excellence and permit the showcasing of efficient technologies, systems, and business practices throughout the country.

Other special features that would need to be included in any new DR Project intervention are: enhancing customer relations and improving overall utility efficiency in both the urban and rural sectors. In the case of rural pilot projects, the role of village level communities, co-operatives, and private entrepreneurs in managing the business of rural power distribution will also need to be considered. USAID sees its role in distribution reform as an integral part of other USAID initiatives (such as the Water/Energy Nexus in Agriculture Project) that are being pursued under the new Mission's Energy/Water Strategic Objective (SO), specifically the emphasis on advancing end-use efficiency of agricultural pump sets and sustainable use of ground water resources. The new activity being contemplated by USAID will be complementary to the critical reform activities being undertaken by (i) the GoI through the APDRP scheme, (ii) the multilateral development banks (such as the ASTAE led AIJ-Agricultural DSM Project in AP), and (iii) bilateral organizations such as DfID. This new DR intervention activity will also link with the currently ongoing USAID/India activities such as ECO, GEP and WENEXA.

Any new activity by USAID will also investigate options such as distributed generation for their cost-effectiveness and reliability of supply including other grid-side benefits. In addition, USAID will need to link its intervention in distribution reform to co-benefits in terms of air quality control and greenhouse gas mitigation.

USAID plans to solicit active participation of lead non-banking financial institutions such as the Power Finance Corporation (PFC), Rural Electric Corporation (REC), IDFC, IL&FS and others in the program implementation process. In addition, any intervention by USAID will also be coordinated with smaller financial institutions such as SREI and others to facilitate links with NGOs and local communities. Annex III provides detailed descriptions of illustrative financial intermediation approaches for USAID to work with the PFC and IDFC in the distribution reform area.

B. STRATEGIC CONTEXT

India's power sector is characterized by inadequate and inefficient power supply. Plant availability and efficiency are generally low, and system losses are untenably high throughout India's transmission and distribution networks,

specifically the secondary low tension (LT) or last mile distribution networks. The financial performance of the sector is unsatisfactory with low tariffs, heavy cross-subsidies, poor collection performance, and revenue losses due to outright theft. The situation has become even more serious due to increasingly tight State budgetary resources that have constrained supply expansion and investment in upgrading T&D systems. Any solution that addresses the problem of sector profitability must necessarily target the issue of high T&D losses estimated at over 50% in many Indian states amounting to over $ 6 billion annually or about 2% of India's GDP. These commercial losses, which have historically doubled every 3 years, represent double of what the country spends on health and half its expenditure on education.

1. Main Sector Issues

India's power sector is diverse with a large number of central and state level government entities managing generation, transmission, and distribution. Except for a small amount of private power generation introduced during the late 1990s, the entire power sector is in government hands and the entities are vertically integrated monopolies. The key entities at the central and state levels are: (i) the MoP, CEA, NTPC, NHPC, and PGCI at the central level and (ii) SEBs and the newly created Discoms in some of the reforming states. Specifically, the structure of the sector can be summarized as follows:

SECTOR COMPONENT	CENTRAL LEVEL (%)	STATE LEVEL (%)	PRIVATE SECTOR (%)	TOTAL (%)
1. Generation	22	74	4	100
2. Transmission	39	60	1	100
3. Distribution	0	97	3	100

These units do not include over 27,000 MW of captive/industrial power with units greater than 1 MW and a large number of unreported units with capacity less than 1 MW each. The Law does not require reporting of generation units less than 1 MW in capacity.

India's power sector is complex and the reform challenges are formidable due to a number of technical, institutional, structural, financial, and social constraints. It is important to understand these complexities in order for USAID to design its distribution reform intervention activity. Some of the key facts that would guide the design of a new USAID activity are summarized below:

1. The combined losses accrued by the SEBs continue to mount -- increasing to Rs. 30,000 crores in 2001 from Rs. 3,000 crores in 1991. During 1992-1999 the average revenue covered through tariffs stood at 82.2% as compared to the cost of supply. This revenue coverage has

declined to 73.9% during 1999-2000, mainly due to increases in the T&D losses.

2. The cost of producing electric power is approximately half of what the SEBs and the Discoms report as wholesale price that they pay to purchase power. At the same time these distribution utilities are suffering from huge financial losses, largely due to poor billing, metering, and collection.

3. There is a general lack of reliable baseline data. In fact, under the current situation only two specific pieces of data are reliable: (i) the total amount of electricity as an input to the systems being managed by the SEBs and (ii) the total amount of cash that the SEBs deposit in their respective banks.

4. The quality and reliability of power supply by the SEBs is typically unsatisfactory to the consumers. Unresolved complaints have adversely affected consumer confidence in the system.

5. Considerable differences exist in terms of the approach, the reform measures, and the business models needed to address the distribution issues in the urban and rural areas. Urban India is more densely populated and typically the customers are large users of electricity. By way of contrast in the rural sector, often the distances are far and the demand density is low. Estimates from various analysts indicate that of the total 50% or so losses, 30-40% are accrued by industry and 60-70% are due to the domestic and agriculture consumers.

6. Despite the rather poor financial condition of most of the state-run distribution systems there are sporadic success stories that offer lessons that could be applicable to a variety of the SEBs and Discoms in their reform process. For example, NOIDA Power Company, a joint venture between The RPG Group and the Greater Noida Development Authority, is implementing distribution projects in its system that have resulted in significant achievements. Overall system losses have reduced to around 8-9% and the system-wide collection rate has reached 97% despite some political interference. In addition, the customer satisfaction level among both metered and un-metered customers is very high. Some of the measures implemented by NOIDA include GIS and SCADA technologies, various system performance monitoring real time software systems, on-line collection monitoring, and a consumer friendly customer relation management (CRM). Although only the urban and peri-urban customers are currently metered, NOIDA is introducing pilot projects with metering in the villages and in the farm sector. Other reform measures used in several States, for example, Andhra Pradesh and Karnataka include regularization of non-paying customers, effective network management,

improved consumer service, etc. are also delivering impressive results with measurable reforms.

C. GOALS AND OBJECTIVES OF REFORM

Any USAID activity designed to assist GoI in its power sector distribution reform should aim to: a) introducing strategic planning, innovative design approaches, and alternative financing concepts to advance electric power distribution reforms in India, and b) demonstrate best social, business, management, and technological practices to improve the quality, reliability and efficiency of the "last mile" power distribution networks in select urban and rural grids.

Therefore, the specific objectives of any new USAID activity should be as follows:

- Provide strategic technical assistance and training to key power sector entities at the various levels in order to enhance their overall institutional skills and capacity to accelerate the financing and implementation of distribution of reform projects
- Enable the implementation of several full-scale commercially replicable urban and rural DR pilot projects in key reform States in India
- Assist the SEBs and Discoms in developing new project proposals and provide advisory services and funding to leverage additional investments in new DR projects in addition to replicating the pilot projects

1. Key Performance Indicators:

The above listed objectives of any potential USAID intervention should be continuously refined in order to achieve the expected accomplishments of such an intervention. The key performance indicators should include the following:

- Measurable reduction in State subsidies to the power sector thereby favorably impacting State fiscal deficits
- Enhanced overall institutional capacity as measured by greater use of APDRP funds and leveraging of USAID resources in the planning and designing of efficient distribution systems
- Number of activities launched to support preparation, planning, financing, erection, commissioning, and monitoring and verification (M&V) in selected distribution circles, substations and feeders both in the urban and rural sectors
- Measurable reduction of losses in high loss prone feeders through systematic identification and feeder up-gradation programs; and the passage of anti-theft legislation in State parliaments.

- Sustainability of community participatory approaches as measured by the number of rural distribution cooperatives and their annual financial performance

D. ILLUSTRATIVE REFORM INTERVENTIONS

Exhibit III-1 illustrates the overall process for a potential USAID intervention in distribution reform in partnership with a wide variety of Indian counterparts. Since the reform process in India is being carried out at various levels any strategy to effectively participate with the Indian counterparts should parallel this structure in order to maximize the impact of any interventions.

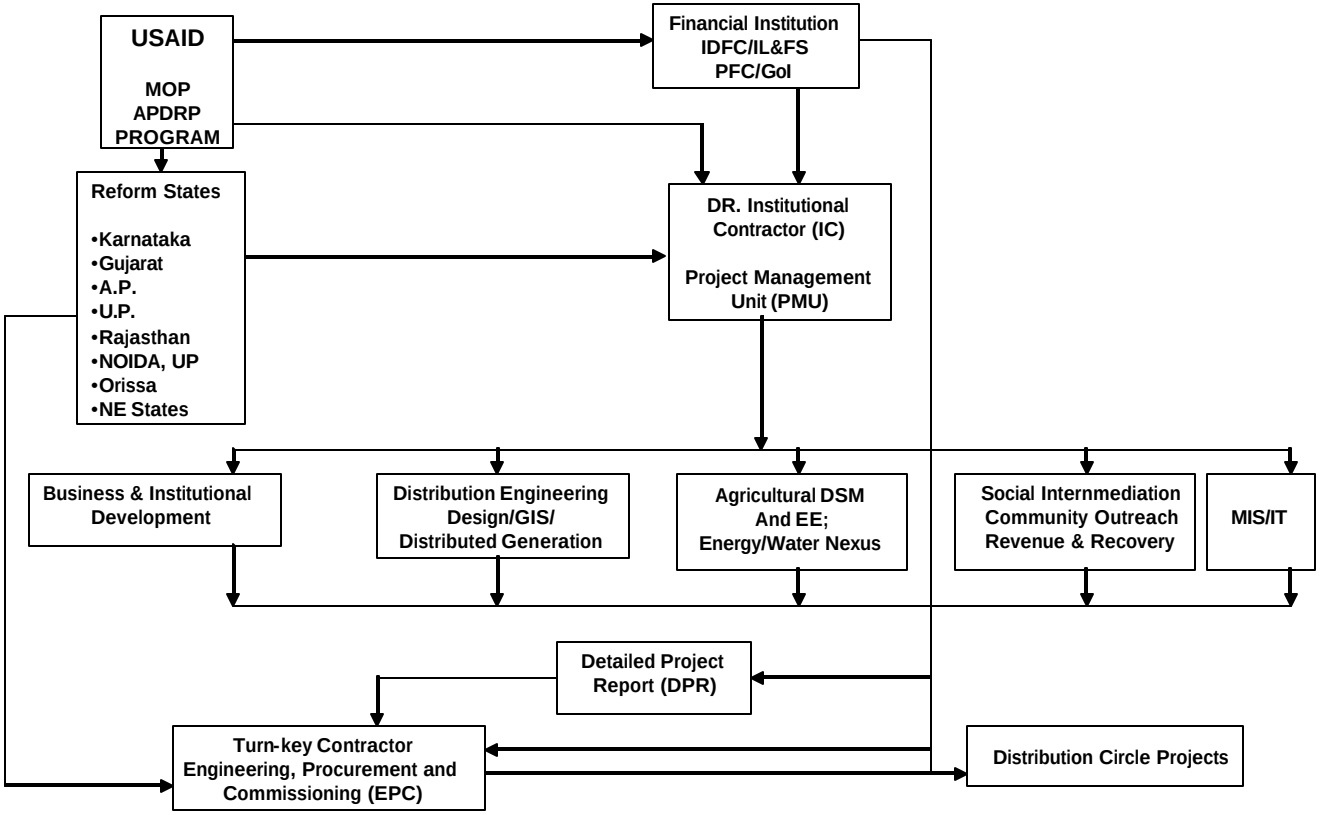
Accordingly, from a conceptual standpoint, any new USAID distribution reform activity should include targeted interventions within three parallel components as follows:

1. Component 1 National Distribution Reform and Alternative Financing
2. Component 2: State Distribution Reform Planning
3. Component 3: Distribution Circle Pilot Project Replication and Outreach

While any USAID interventions under Component 1 and Component 2 may be primarily in the form of coordination and some training and technical assistance, the fundamental thrust of such interventions will need to be under Component 3 aimed at demonstrating best practices in distribution reform. Through a number of successful pilot urban and rural projects at the distribution circle and feeder levels, a new USAID activity should aim to influence the overall distribution reform policies and programs at the national level and distribution management practices at the utility level.

It should be emphasized that any USAID interventions under Component 3 will need to be closely linked to the interventions under Component 2. While the interventions under Component 2 will be mainly at the state level (State government ministries, SEBs, Discoms, and other state level institutions), the interventions under Component 3 should form the bulk of the interventions. The true focus of any USAID activity should be to develop and facilitate the implementation of a few (3-4) distribution reform projects, at the distribution circle and feeder levels, mainly urban projects, and 1 or 2 projects in the rural sector. Therefore, most of the true project development and design work will need to be supported under Component 3. However in order to select the best projects and ensure that the results from these pilot projects will leverage overall SEB and Discom reforms, the work under Component 2 is very significant.

EXHIBIT III-1 ILLUSTRATIVE USAID DISTRIBUTION REFORM INTERVENTION STRUCTURE



The remainder of this section focuses on potential key partners and the types of interventions that USAID could consider as part of its new activity design process.

Component 1: National Distribution Reform and Alternative Financing

This component will enable USAID to work with key parties involved in the implementation and monitoring of the GoI's APDRP scheme. The MoP is the lead entity directing the implementation of the distribution reform program under the GoI APDRP scheme. The key entities at the Center level that have a direct involvement in various aspect the Government's DR program include (i) the MoP -- the APDRP Cell and various committees, (ii) NTPC and PGCI, (iii) Advisor-cum-Consultants.(AcCs), and (iv) others.

Exhibit III-2 illustrates the types of DR interventions that may be includes as part of a new USAID activity in order to support and accelerate the GoI's DR process in general and the APDRP scheme in particular. The key parties should include MoP, the APDRP Cell within the MoP, public financial institutions such as the PFC, and private financial institutions such as the IDFC. Annex III describes illustrative approaches for USAID to partner with key financial institutions in India.

USAID plans to engage the Center level entities through a number of targeted support activities in different areas. Specifically, the USAID plans to design a new activity that will include a well defined engagement at the Center level. From discussions with the GoI officials, such an engagement should embody the following principles:

1. Strategic Coordination of any USAID Intervention with MoP
2. Technical Assistance and Management Support in Monitoring and Evaluation of the APDRP Scheme
3. Financial Intermediation to Leverage Urban and Rural Pilot Project Financing and Replication

Exhibit III-3 includes illustrative activities that the new USAID distribution reform initiative could include based on consultations with the MoP as part of Component 1. An important element of a new USAID intervention should be to channel financing for the implementation of selected urban and rural projects at the distribution circle and feeder levels. Given the striking difference between the urban and rural projects in terms of risks, customer practices, load patterns, etc., innovative financing and institutional mechanisms will be needed to implement any pilot projects jointly selected by USAID and GoI. Annex III provides two sample approaches for financial intermediation, one involving PFC in affecting leveraged financing for selected high pay-off urban projects under the APDRP scheme, and the other, involving IDFC for channeling investments in similar rural projects. This will be the most crucial intervention under Component 1 in order to facilitate the implementation of any new USAID intervention.

EXHIBIT III-2: COMPONENT 1 – NATIONAL DR STRATEGY AND ALTERNATIVE FINANCING

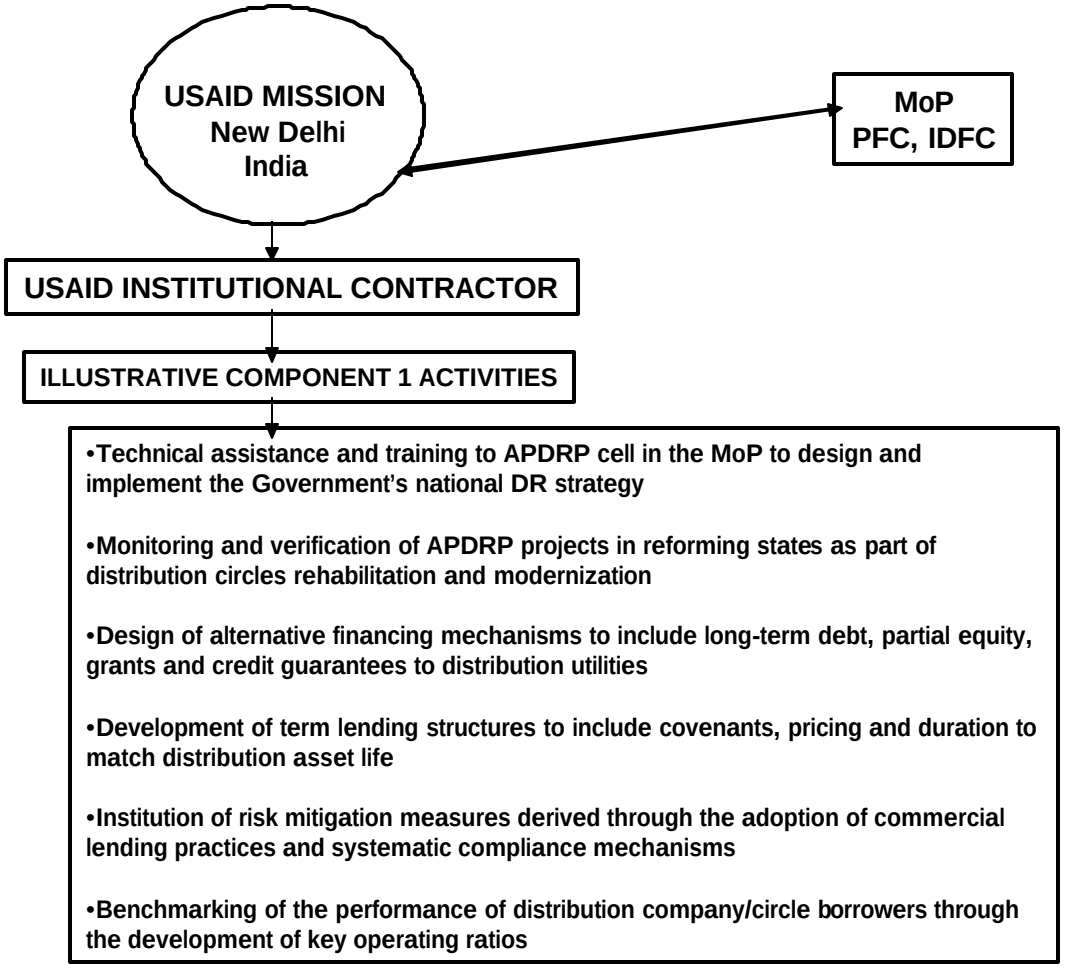


EXHIBIT III-3

ILLUSTRATIVE ACTIVITIES/INTERVENTIONS
COMPONENT 1: NATIONAL DR STRATEGY AND ALTERNATIVE FINANCING

CATEGORY OF INTERVENTION	SPECIFIC ACTIVITIES	PARTICIPATING ENTITIES	EXPECTED RESULT
1. Coordination of the DR Project Intervention with GOI	• Quarterly coordination meetings with key GoI entities and officials to review progress, problems, and proposed solutions • Development methods of linking and leveraging USAID investments with APDRP funds in order to maximize program impact • Coordination of the USAID DR Project Intervention with other donor projects	MoP, APDRP Cell, NTPC, PGCI, and other national level NGOs and industry associations	• Enhanced institutional capacity • Greater and more effective utilization of the APDRP funds • Potential leveraging USAID and APDRP funds with other funds • Greater synergy among parallel distribution reform initiatives by various donors
2. Technical Assistance and Management Support to MoP	• Advisor support to the MoP and the APDRP Cell in the development of their plan for the implementation of the APDRP scheme • Assistance in designing the reform conditionalities, Memoranda of association with the states, and reporting formats to facilitate effective evaluation of reform success	MoP, APDRP Cell	• Enhanced institutional capacity • More effective methods to design reform conditionalities and enhanced performance by states • Better capability to allocate grants and loans to states based on actual achievements

	• Technical assistance in designing appropriate MIS systems for project evaluation, ranking and costing • TA and training in project monitoring and results reporting • Assistance in overall APDRP program management and coordination between the Center, the states, the SEBs, and the Discoms • Strategic advice on models for the urban and rural sectors to maximize reform and making subsidy more transparent and targeted		• Greater institutional efficiencies and more effective reporting and evaluation of reform results • More fair and equitable allocation of APDRP funds to different states • Enhanced capacity for MoP to seek outer year APDRP funding from the center based on actual performance, results, and documented needs
3. Technical Assistance and Capacity Building for NTPC, PGCI and Advisor-cum-Consultants (AcCs)	• Technical assistance and executive training in designing methods for project development, selection, and prioritization at the distribution circle and feeder levels • Assistance in the development of well understood, transparent, and clear criteria for pilot project selection for financing under the APDRP scheme • Assistance to the AcCs in developing uniform methods for project design, evaluation, and analysis • Assistance in the design of data	NTPC, PGCI, CPRI, NPC, and others	• Enhanced technical capacity to design, evaluate and recommend pilot projects for APDRP • Better data bases leading to greater confidence in selecting circles and feeders with the maximum potential for efficiency gains, loss reduction, higher revenues

	base to evaluate the commercial successes of the distribution circles and the feeders as potential feeders		
4. Financial Intermediation to Leverage Urban Pilot Project Financing and Replication	• Assistance in developing criteria for financial leveraging of USAID funds with the APDRP funds • Blending of grant and funds for strategic high payback distribution reform projects • Design of loan guarantees, credit guarantees, and other interventions for risk mitigation • Support in program design and the structure of the new lending facility • Technical assistance to PFC in designing systems for project/loan performance monitoring • Assistance in the design of performance, operating/engineering and governance controls on the borrowers • Assistance in designing a customer development plan and a customer service approach to ensure that the investments are viable and yield the desired results	PFC, REC, IDFC, IL&FS, IDBI, ICICI, other financial institutions	• Greater financial leveraging will open opportunities for more reform projects implementation • Innovative non-recourse financing schemes will create greater confidence in financial markets • More DR and stronger financial conditions of the SEBs will reduce financial burden on the States • Greater prospects for ad hoc designs, programs and practices to be replaced by more uniform systems
5. Financial Intermediation/Rural Pilot Project Replication	• Designing specific interventions that address the social and institutional infrastructure problems		

Component 2: State Distribution Reform Planning

The new USAID DR activity will need to closely engage with the State governments and various State institutions and entities involved in the power sector. More specifically, the interventions under the project will need to include specific engagements with a variety of entities including the departments and ministries of energy, state electricity boards (SEBs), the newly created distribution companies (Discoms), the state ministries of rural development, rural electric cooperatives, and rural energy delivery entities such as various NGOs. In addition the activity would also need to include specific interventions needed to strengthen the institutional capacities of state energy regulatory commissions (SERCs).

Exhibit III-4 illustrates the conceptual approach for the engagement of USAID with the state level entities involved in the power sector to leverage electricity distribution reform in selected States. The exhibit also identifies the key stakeholders and illustrative examples of interventions. In order to develop targeted interventions under this Component, it is important to understand the key problems facing the various state level entities, especially, the SEBs and Discoms. Annex IV provides the background and rationale that would need to be considered by USAID in designing interventions under Component 2 - Distribution Reform Planning.

The context, described in Annex IV, confirms that any new USAID DR activity will have a very direct role in pushing distribution reforms through a comprehensive engagement with the SEBs and Discoms, state regulatory commissions, and other State government agencies. While specific reform projects will need to be implemented at the distribution circle and feeder levels, the full buy-in and active participation of the States will be crucial in creating an institutional climate for the transformation of the circles to more commercial management and the replication of successful commercial approaches to other circles and feeders throughout the States.

Under Component 2, USAID would need to engage the state level entities through a number of targeted support activities in different areas. Specifically, the a new USAID DR activity will include the following four specific categories of engagement at the state level, as needed, and jointly agreed to between the USAID and the States where pilot projects may be selected under Component 3.

1. Coordination of the intervention with the state energy ministries, ministries of rural development and state energy regulatory commissions (SERCs)

2. Technical assistance and management support to SEBs and Discoms for pilot project design and implementation

USAID will need to closely work with the SEBs and Discoms in the selection of pilot projects for implementation. The specific type of interventions under the above four categories should be designed solely for the purpose of enhancing the selection and implementation of the selected urban and rural pilot projects. Typical interventions could include the following:

1. Periodic coordination with the State ministries of energy and rural development and state regulatory commissions (SERCs)

EXHIBIT II-4: COMPONENT 2 STATE DISTRIBUTION PLANNING AND DESIGN

2. Introduction of best practices for utility regulation, tariff, and licensing processes to SERCs to the extent it is directly relevant to the pilot project implementation

USAID MISSION
New Delhi
India

3. Targeted TA and training on (i) approaches to introducing commercial operations at the urban and rural levels, including projects at the distribution circle and feeder levels, (ii) introduction of modern accounting and management principles for transition to commercial operations, (iii) introduction of modern technologies and systems for improvements in operational efficiency - trouble call management, load management, preventive maintenance, electronic metering, GAS mapping and feeder management, system planning, project management, EPS, and general modernization, (iv) CRM programs, (v) management of distribution circles and feeders selected as pilot projects, and (vi) commercial operations of distribution circles as profit centers,

4. Direct assistance to managers and technicians in the distribution circles and feeders on technical functions such as project engineering, EPC, project supervision, costing and accounting, and procurement and assistance in evaluating outsourcing and franchise approaches to improving rural energy distribution, reducing losses, and increasing collections

5. Assistance in designing more customer friendly meter reading, billing, collection, and complaint management approaches to integrate the rural consumer into the mainstream of the electric power business

CORE International, Inc.

6. Assistance in designing conditions that would make it attractive for private contractors to take on distribution management at the distribution circle and feeder levels

Annex IV includes a more detailed description of potential state level interventions in order to facilitate pilot project selection and implementation.

It would be important for USAID to be able to ensure that the SEBs and Discoms are fully committed to any specific interventions proposed by USAID as part of engagement under Component 3. Secondly, in the case of most SEBs and Discoms the decision-making process is not at the distribution circle and feeder levels. Also whatever data are available, they are at the utility level and not at the distribution circle and feeder levels. The bulk of the management capacity is vested at the utility level, whereas the capabilities at the distribution circle and feeder level are mainly at the technician level. Functions and decisions related to project design, development, investments, billing, metering, collection, and customer service, are all under the jurisdiction of the utilities, typically in their head offices.

The process of transitioning business operations from the utilities to the distribution circles will take time. Through the replication of successful pilot projects at the distribution circle and feeder levels, it is hoped that, overtime, the distribution circles will begin to function as commercial entities or profit centers. In the interim, any pilot projects under a new USAID activity will play a crucial role in facilitating this transition process leading to an initial reform of the power sector and the eventual privatization of distribution. The discussion of the illustrative interventions under Component 3, therefore, is provided in substantial detail.

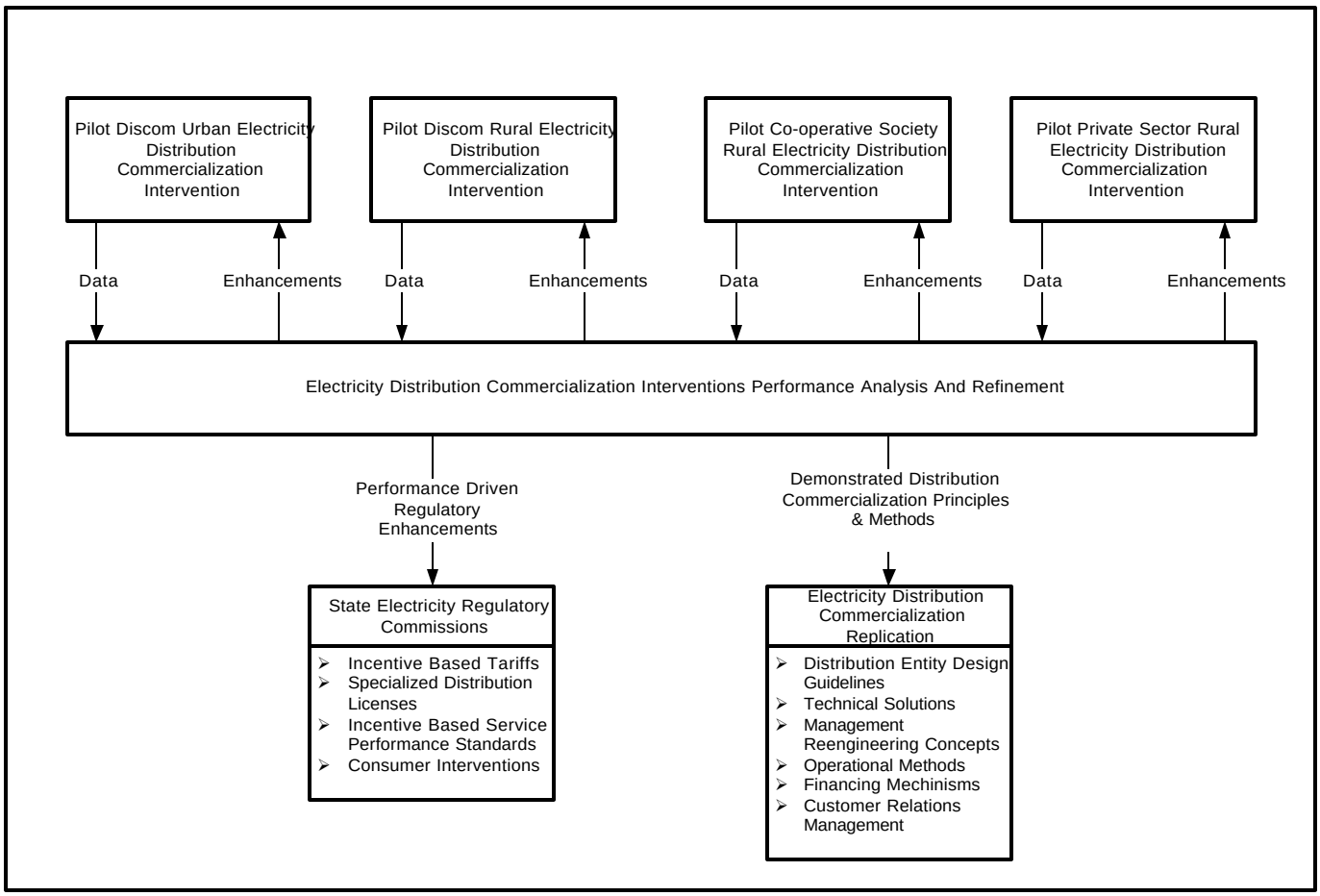
Component 3: Distribution Circle Pilot Project Replication and Outreach

Under Component 3 any new USAID activity will need to address the issues of electricity distribution reform and restructuring at the Discom operating level with actual project implementation at the distribution circle and feeder levels. The pilot projects will demonstrate, refine, and initiate replication of management, operational, and technical practices for widespread and self-sustained commercial operation of urban and rural electricity distribution. Such interventions will require interactions with distribution entities, urban and rural consumers, and the State Electricity Regulatory Commissions.

Exhibit III-5 presents an overview of Component 3 illustrative organizational structure and identifies sample electricity distribution reform interventions. The overriding objective of Component 3 should be to affect the actual demonstration of commercial practices that, if widely implemented, would result in the financial and commercial turnaround of electricity distribution entities to reduce their current heavy and unsustainable drain on State fiscal budgets. The rural

electricity distribution pilot project and other related interventions will also demonstrate new approaches to addressing the critical issue of the long-term financial viability of rural electricity supply within the context of electricity distribution reform in India.

Exhibit III-5
Component 3: Illustrative Organizational Structure



The illustrative structure for Component 3, as shown in Exhibit III-5, consists of four principal parts:

- **Part 1 - Pilot Electricity Distribution Reform Interventions**
  The performance of pilot distribution reform interventions in selected reforming States to demonstrate the managerial, operational, and

customer relations practices required to transform electricity distribution into self-sustaining, commercial operations in both urban and rural settings

- **Part 2 - Electricity Distribution Commercialization Refinement**
  Interactive analysis and refinement of the pilot reform projects and interventions during and the conclusion of the implementation to maximize technical, managerial, and operational efficiencies and prepare validated reform replication guidelines and practices for widespread replication at minimum cost

- **Part 3 - Performance Driven Regulatory Enhancement: Interaction with the Reform States Electricity Regulatory Commissions**
  Development and implementation of electricity distribution regulatory enhancements and incentives, including incentive based tariffs, to promote and support widespread replication of the Pilot Commercialization Interventions

- **Part 4 - Electricity Distribution Reform Replication**
  Communication and marketing of pilot reform project interventions results and implementation techniques to all reforming States and provision of targeted distribution reform planning and implementation support to actively promote expeditious, cost-effective replication throughout India

In addition to the overriding objective of demonstrating the pilot project interventions that can lead to the ending of the unsustainable drain of electricity distribution subsidies on State fiscal budgets, major objectives of Component 3 should ideally also include the following:

- Demonstration of best practices for both urban and rural electricity distribution

- Ensuring that the electricity distribution reform models that emerge from the pilot interventions have the potential to be eventually financed on commercial terms and be financially self-sustaining

- To assess and validate as wide a range of technical, managerial, and operational solutions to the problems currently plaguing electricity distribution in India as practical

- Target pilot electricity distribution reform interventions to achieve maximum impact on distribution reform and restructuring.

a. Drivers for the Selection of Pilot Distribution Reform Projects

The pilot distribution reform projects should be selected in order to showcase best practices in urban and rural distribution reform. Operation of electricity distribution on accepted commercial terms has the potential to significantly reduce, if not eliminate, current State electricity supply subsidies. It also drives the financial viability of the entire electricity power sector operations since it is the sector's primary revenue source. Annex V provides an illustrative approach for Component 3.

Electricity distribution throughout India is currently plagued by deteriorating and strained physical infrastructure, weak management practices, and non-cost reflective rural retail electricity tariff structures resulting in a vicious circle of inadequate revenue collection, increasing deterioration of physical distribution assets, poor electricity supply quality, extreme electricity losses (both technical and commercial losses), poor collection of billed electricity, and extreme consumer dissatisfaction with the State electricity distribution entities. The situation is particularly acute for rural electricity distribution, where past government policies have resulted in current tariffs (widely based on flat rate tariffs and no metering) that are mostly well below the cost of electricity supply. The pilot electricity distribution reform interventions should, therefore, be selected by extensive analysis of these root causes. The interventions selection process should also draw on the experience of other developing nations. Some of the key electricity distribution managerial, operational, and technical issues that would be necessary in developing pilot project interventions are as follows:

(1) The importance of sustained and sound customer relations management (CRM) and the integral involvement of existing and future consumers, particularly rural consumers

(2) The importance of improving both the level (reduced and more controlled and orderly electricity rationing or continuous electricity supply) and quality of electricity supply as critical components in building consumer confidence and support for electricity distribution reform and, potentially, reducing electricity consumption

(3) The importance of an integrated approach to addressing electricity losses and end-use efficiency at "both sides of the meter", particularly in the context of improving the efficient use of electricity for agricultural irrigation (India is estimated to have at least 50 million irrigation pump sets)

(4) Breaking of the current approach to electricity distribution management by reengineering distribution managerial and operational functions and empowering managers at all operational levels, including, if necessary, revision of labor union practices

(5) Provision of adequate initial training and continuing training support to all distribution management and operations staff as part of the pilot project implementation process

(6) Development of adequate interim financing mechanisms for distribution systems rehabilitation, modernization, and expansion to allow for successful pilot projects and to bridge the time period until distribution entities are able to access financing from conventional commercial sources

(7) The importance of application of viable best practices that have been demonstrated under prevailing conditions for the elimination of electricity theft, reduction of technical electricity losses, and electrification extension to currently un-served rural consumers. This includes the importance of metering both the electricity distribution network and customers

(8) The need to demonstrate commercialization interventions that can generate adequate revenues for self-sustained operation or that minimize and provide for phase out of required subsidies

(9) Targeting of the pilot projects at the distribution circle and feeder levels that will be of maximum benefit to electricity distribution reform at the national level.

The last consideration suggests that the pilot projects be selected in the reforming States. The Discoms established or to be established in these States are judged to provide the best platforms for USAID-initiated best practices demonstration and maximize the potential for widespread reform.

b. Urban and Rural Electricity Distribution Differences and Challenges

The consumer profile, electricity demand pattern, tariff, consumer education and acceptance, load density, collections rate, etc. all are very different for urban and rural consumers.

In comparison with rural consumers urban consumers are characterized by considerably higher electricity load densities due to the high population density in urban areas. Economic conditions in urban areas also mean that electricity consumption is much higher than for rural areas. Because of the higher electricity consumption, the relative compactness of the spatial distribution of consumers, and the availability of greater infrastructure, urban electricity distribution, compared with rural distribution, is a prime target for the selection of pilot distribution projects. Compared with rural electricity distribution, urban distribution has the potential for quicker realization of self-sustained financial

operation and has significantly greater potential to attract both private sector financing and ownership. The urban pilot projects will also be more embedded in current Discom operations than the rural projects. This means that there are significant differences that would need to be considered in the design of urban and rural pilot projects.

In most urban areas, residential consumers comprise the largest number of consumers followed by commercial and industrial LT consumers. For example, out of 2.07 million consumers served by BSES in Mumbai in 2000-01, 1.76 million (85 percent) were residential consumers and 0.26 million (13 percent) were commercial consumers. On the total energy sold basis, residential consumers accounted for 55 percent and commercial consumers for 23 percent in the BSES service area in Mumbai in 2000-01. In addition, a significant reason for the greater attractiveness of urban compared with rural consumers for the selection and implementation of pilot distribution projects is the higher tariffs prevailing in urban areas. For example, the tariff variance between different classes of urban and rural consumers can be as much as four fold as shown below in the case of Andhra Pradesh, a reforming State.

Consumer Category	Retail Tariff (paise/kWh)
1. Residential	
1 kW (50 kWh/month)	106.0
10 kW (1000 kWh/month)	347.0
2. Commercial	
5 kW (200 kWh/month)	436.0
50 kW (4000 kWh/month)	501.3
3. Agriculture	
3 hp, 10 % load factor (163 kWh/month)	29.1
5 hp, 10 % load factor (272 kWh/month)	34.3
10 hp, 20 % load factor (1089 kWh/month)	31.5

Other important aspects of urban electricity distribution compared with rural distribution that have a bearing on pilot project selection and the potential for successful wide-scale replication are as follows:

- Power supply to urban areas is given on a continuous basis, i.e., 24 hours/day. (In rural areas electricity is typically only supplied for 8-9 hours per day (3 phase power))

- Within consumer categories, there are significant differences between the consumption levels of urban and rural consumers. The range of variation in consumption level across consumers is much higher in urban areas than in rural areas. This variation is primarily due to the variation in socio-economic conditions of residential consumers and variation in the scale of operation of commercial consumers

- Because of higher load densities, LT:HT ratios for urban distribution networks are considerably lower than those for rural areas. However, because urban loads are higher than rural loads, urban distribution networks still experience high technical electricity losses and poor voltage conditions

- Urban consumers are metered unlike most rural consumers. However, despite meters being installed, non-functioning and faulty functioning of meters and meters with broken or no seals are serious problems in urban areas contributing to commercial electricity losses.

Typical Urban Distribution Problems

Typical problems that will likely dictate the design of urban distribution projects can be summarized as follows:

- Poor management and Lack of Employee Performance Incentives at the SEBs or the Discoms

- Supply Shortages, Unscheduled Electricity Rationing, and High Commercial losses

- Poor Physical line Conditions, High Technical losses, Low Quality Voltage, Overloading of Feeders and transformers, Broken meters, Inadequate Network metering, etc.

- Un-served and Dissatisfied Consumers, Erratic Billing Cycles, Poor Trouble Call Management, etc.

Typical Rural Distribution Problems

Many of the distribution problems associated with urban distribution systems are also common to rural systems. However, rural consumers and system have certain additional and unique problems that can be summarized as follows:

- Retail tariffs are significantly lower than cost of electricity supply, which makes rural energy supply projects non-commercial and unattractive to private investors.

- Generally, the collection rate is much lower than in the urban areas, which together with low tariff further makes rural distribution projects uneconomical.

- Given the low collection rates and low tariffs, the quality and reliability of supply to rural consumer is generally worse than for urban customers.

- A lack of social infrastructure and rural energy delivery mechanisms closest to the consumer makes rural consumer dissatisfied and results in a lack of consumer confidence in the energy providers.

- The incidence of theft through illegal connections is generally higher resulting in higher commercial losses.

- The rural consumer generally does not get the quality of service, attention, and problem resolution as promptly as the urban consumer, which further erodes consumer confidence.

- Excessive political interference necessitates the SEBs and Discoms to provide low-cost or free electricity often at remote locations with low demand density.

These unique problems require that the rural pilot project be designed very differently from urban projects. This point has also been emphasized in the recently released Distribution Policy Committee Report commissioned by the Ministry of Power and completed in March 2002.

c. Urban Pilot Project Selection and Implementation Issues

This subsection summarizes key issues that would drive the development and implementation of selected urban pilot distribution reform projects. The urban pilot projects will involve major activities at the following three Discom management levels:

- **Discom Level:** A designated nodal officer at the level of the Board or just below it, e.g. Director or Chief Engineer responsible for Reforms/Regulatory Affairs

- **Distribution Circle Level:** A DR intervention cell headed by the Superintending Engineer heading the Circle and including the Divisional Engineer/Executive and the Engineer responsible for the area in which the pilot project is located

- **Pilot Project Level**: The Divisional Engineer/Executive Engineer responsible for the area in which the Pilot Intervention is located.

For a pilot urban distribution project to be of value in the context of electricity distribution reform and restructuring, it must be representative of prevailing conditions. Among other things, this implies that some, if not all parts, of the

network distribution feeders and/or other components will be physically and operationally substandard and their design will be far from optimum for efficiently meeting consumer requirements. An exception may be feeders serving certain types of industrial consumers.

The activities in developing pilot projects will include (i) the development of standards and specific performance targets, (ii) design criteria for the rehabilitation and modernization of the selected electricity distribution feeders (11 kV and LT distribution systems including metering), (iii) load size, (iv) collections rate, and (v) other operations factors. A major part of the pilot project preparation will be to develop all requirements for equipment and materials, design engineering, and the need for an engineering, procurement, and construction (EPC) contractor to implement the construction works.

A major component of the pilot project preparation process will be to institute a business model at the distribution circle or the feeder level. This will require significant reengineering of urban distribution operational and business practices within the selected Discoms. To attempt to ensure the success and sustainability of the reengineering process, it may be useful for the selected Discom to create a Pilot Distribution Reform Cell. Such a Cell could be the focus of all management and operations intervention at the Discom and include all Discom employees who will be involved in the pilot project design and implementation.

Integrated with existing business processes reengineering should be the design of a complementary CRM program. The objective of this program will be to use the pilot projects to introduce state-of-the-art CRM to the Discom and build capacity for its application throughout the Discoms urban distribution operations and new project development. The CRM program should also include potential urban DSM opportunities such as: lighting (conversion of incandescent lamps (GLS) to fluorescent lamps (FTL) or compact fluorescent lamps (CFL)); space cooling; and refrigeration in residential and commercial applications.

The design of the pilot projects should also include a performance monitoring and reporting system, which will serve three purposes: (i) comprehensive monitoring of the pilot projects, (ii) an analysis of performance results, and (iii) reporting of results. The performance assessment baseline will establish the conditions before the pilot project implementation against which intervention results can be quantified.

d. Rural Pilot Project Selection and implementation Issues

SEBs are almost the exclusive suppliers of electricity to India's rural consumers. In the reforming States, the new Discoms have inherited these consumers, but, with the exception of Orissa, they all remain entirely State owned. It is estimated that at least 98 percent of rural consumers currently receive their electricity from an SEB or successor Discom. This situation, coupled with the critical nature of

the core electricity distribution reform problem of achieving long-term financial viability for rural electricity distribution, dictates that any rural pilot projects be directed at dealing with rural electricity supply within the context of Discom ownership and operation.

The electricity load in the rural sector is a major cause of the electric power sector's financial problems. Furthermore, the dimensions of the rural supply problem are poorly quantified, a factor complicating the design of solutions. Part of the quantification problem is attributable to the SEBs' use of rural electricity consumption as a convenient hiding place for both technical losses occurring elsewhere in their systems and a significant portion of the electricity theft by non-rural consumers. Such misallocation of electricity losses is made convenient by the widespread use of flat rates for rural consumers and a lack of adequate metering both for rural consumers and the rural electricity distribution networks.

Current rural electricity supply in most States with substantial rural load is characterized by extremely weak operation by any standards, including the poor performance levels experience in India's urban centers. In rural areas, residential consumers comprise the largest number of consumers followed by agricultural consumers. For example, out of 384,849 electricity supply connections in the 9 rural electricity supply cooperatives in Andhra Pradesh in 1998-99, 260,584 (68 percent) were for residential services and 92,565 (24 percent) were for agricultural services Compared with urban consumers, the variation in the consumption levels for rural consumers is less. For agricultural consumers, the variation is less as cropping practices and pump set sizes are not much different within a given area.

Based on the information developed during the field visit be the Team, the rural distribution pilot projects need to be targeted at a set of feeder lines (11 kV lines) emanating from a single rural electricity distribution substation. It is believed that funding from USAID and other sources such as other donors, the Intervention host Discom, the APDRP, and public and private non-banking financial institutions, such as the PFC and IDFC, can be attracted to allow the feeders for a complete rural substation to be included in the Intervention. The management responsibility for a rural substation would typically be at the Discom distribution circle level.

The initial part of the rural pilot project should be divided into three phases: 1) Design; 2) Construction, Installation and Training; and, 3) Implementation. The Design Phase will involve: electricity distribution network components engineering; the design of new Discom business processes; design of a rural consumers intervention process including engineering for DSM applications; and design of the Intervention performance monitoring program. The engineering and business and consumer processes resulting from the design phase should be implemented within specific parts of the Discom and with consumers in the Construction, Installation and Training Phase to establish the physical and

operational conditions required for actual pilot intervention implementation. The Implementation Phase will involve actual electricity distribution, retail sale, and consumer consumption over the duration of the project intervention following the completion of the Construction, Installation and Training Phase except for the continuation of selected training.

During the Design Phase, a list of specific design criteria should be developed. These may include (i) project size (feeder, substation, etc.), (ii) current operational characteristics (equipment vintage, failure rate, etc.), (iii) potential for quick reform, (iv) potential for implementation of best practices such as the Bangladesh rural electrification approach, (v) existing customer base and profile, (vi) quality and quantity of baseline data available that would permit an effective performance evaluation, and (vii) other factors that the concerned Discom may wish to include as part of the pilot project selection and design.

In order to maximize the potential for replication, specific design standards should be developed that would be later used in the tenders for the procurement of goods and EPC services. The standards may include specific performance targets and design criteria for the rehabilitation and modernization of the pilot electricity distribution feeders (11 kV and LT distribution systems including metering) and, if determined to be part of the intervention, extension of the feeders to serve additional rural consumers. They should also cover all other operational aspects of the pilot intervention.

While rural network engineering will present significant intervention challenges, experience in India demonstrates that the most critical aspects of realizing commercial operation of rural distribution are related to management practices and appropriate and adequate customer intervention. Most management functions related to rural distribution operations are at the Discom level, where there is a considerable lack of commercial business practices. At the substation level, there is even more limited commercial practice. Therefore, designing and implementing rural pilot projects along commercial lines will require significant reengineering of rural distribution operational and business practices at the District Management level.

Although business processes reengineering has been used for over a decade by many companies, it has not been attempted for rural electricity distribution operations in India. The objective of business processes reengineering should be to develop within the Discom District Management the full capabilities to manage and operate the selected rural pilot projects as well as new projects in the future.

As part of designing a program to implement the required business processes reengineering, a reengineering training program may need to be developed. This program will provide the District Level staff and managers with the capabilities to actually implement the reengineering required for the successful pilot project

implementation. It will also provide them with the skills and understanding to develop appropriate business plans for use during the implementation phase and to sustain it long after the pilot project implementation is completed.

Another key area during the Design Phase will be the need to design a CRM program specifically geared to the rural consumer and one that captures the unique problems of rural electricity distribution. Rural CRM is an approach that is currently being pioneered in India as a result of experience with electricity distribution privatization in Orissa and growing recognition of the rural dimensions of electricity distribution reform and the need to design stand-alone distribution entities. Many of the important features of the rural CRM approach that is currently being developed for new distribution entities are found in the few successful electric supply co-operative societies that are currently operating in India. Similar approaches that also embody some of the main features of rural CRM currently being developed in India have been successfully applied in other South Asia nations, such as Bangladesh and Nepal. Collectively, the above experience substantiates the conclusion that viable rural CRM programs can be designed and implemented.

An example of rural customer intervention that was an early pioneering effort in India was implemented by the Xavier Institute of Management (XIM) in Orissa. When BSES purchased controlling interests in the newly created WESCO and NESCO electricity distribution companies under the Orissa distribution privatization it quickly found that a significant revenue drain was associated with negligible collection of billings from isolated villages and past due payments. To address this problem, XIM undertook two pilot projects in which it intervened directly with non-paying villages to devise practical approaches to improving collections. XIM found that the key to improving collections was to improve the quality of service provided to the villages. To improve both service quality and billing collections, XIM organized Village Committees (Bidyut Sanghas) and gave them significant roles in managing electricity distribution non-technical operations at the village level. As an incentive to take on village level distribution operations and improving collections, the Village Committee's were allowed to keep a share of collected billings. The actual amount of collected revenue returned to the Village Committees is tied to an incentive schedule; the Committees' share increases with the level of collection and does not start until a specific level of collection is achieved. The basic XIM approach has worked reasonably well in Orissa and has been replicated in over 4,900 villages. In WESCO and NESCO, revenue collection from isolated villages has increase by 60 to 85 percent. As a result of this success, XIM has been retained by KPTCL to adopt their rural intervention process to rural conditions in Karnataka. This success, along with the experience in Bangladesh, offer interesting examples of best practices that should be incorporated in the preparation of rural pilot projects.

Similar to the case of urban distribution pilot projects, the preparation of the rural pilot project should also include a performance monitoring and reporting system, which will serve three purposes: (i) comprehensive monitoring of the pilot project, (ii) an analysis of performance results, and (iii) reporting of results. The performance assessment baseline will establish the conditions before the pilot project implementation against which intervention results can be quantified.

During the Implementation Phase, the following activities will need to be conducted:

- Procurement of equipment and commodities required for the pilot project in accordance with USAID commodities procurement guidelines and regulations. Procurement would be performed by the Discom Procurement Operation under USAID procurement rules.

- Implementation of the methodology and procedures for establishing a pilot project performance assessment baseline. Baseline data collection would be performed by the Discom

- Construction and commissioning for rehabilitation, modernization, and expansion of the feeders, including substation and feeders metering, by the Discom. This could involve the use of contractors hired and managed by the Discom.

- Provision of training in business processes reengineering to the Discom and the implementation of the CRM Program

Annex V provides considerable details on Component 3 intervention methodologies and include a discussion of the roles of various parties that may be involved in designing and implementing the pilot projects.

IV. FINANCIAL ANALYSIS OF URBAN AND RURAL DISTRIBUTION PROJECTS

Chapter III described the most fundamental differences between urban and rural areas, consumers, distribution requirements, and established the basis that the urban/rural differences require very different approaches to designing and implementing electricity distribution reform. In order to further elucidate the complexities of urban and rural distribution, the Team evaluated a number of urban and rural distribution reform projects that are being planned by some of the Discoms and private sector entities. Based on this evaluation and extensive discussions with public and private utilities, the Team conducted a detailed financial analysis of distribution reform for a typical urban project. The same analysis was repeated for a typical rural distribution reform project in order to further confirm and establish the need for implementing very different models for the two sectors.

The Team developed a set of typical benchmark parameters for distribution systems in urban and rural areas. These parameters were used for the financial analyses carried out by the Team. The basic assumptions for developing the models and the results are discussed below for each of the two cases -- urban and rural distribution.

A. URBAN AREAS ELECTRICITY DISTRIBUTION SYSTEM IMPROVEMENT

Key Analysis Parameters

An urban area having an area of 50-100 sq. km. and a population of around 200,000 persons has been considered. This could be a small town, or a part of a town or a city, and could correspond to one sub-division within a distribution circle. The distribution system in such an area has been taken to typically comprise of two 33/11 kV sub-stations each having (i) 6 feeders of 11 kV level, (ii) approximately 133 km of 11 kV lines, (iii) approximately 200 km of LT lines, and (iv) approximately 400 distribution transformers. Other typical characteristics are shown in Annex VII.

In addition, consumer mix in urban areas has been assumed to include as a mix of domestic, commercial and LT industrial consumers. A total of 12 consumer profile cases were defined corresponding to different consumer density, consumer mix, load density and load factor as shown in Annex VII. These cases correspond to ranges of (i) 32,500-62,000 consumers, (ii) 36.5-125.0 MW connected load, and (iii) 62-326 million units per year energy input for the typical urban analyzed.

The following distribution system improvements were selected for potential application in distribution circles in urban areas:

- Conversion of LT lines to HT lines
- Reconductoring of HT and LT lines
- Replacement of bare conductor LT lines by insulated conductor lines
- Replacement of large 3 phase distribution transformers by smaller energy efficient 3 phase or single phase transformers
- Single phase distribution in congested areas, and meters at customer premises.

These would result in reduced technical losses and also enable commercial losses to be controlled. The range of costs for such improvements has been taken as 2,000-3,000 Rs./kW connected load. For the cases considered as part of this analysis, this corresponds to a range of Rs. 7.3-38.0 crores for the cost of the distribution reform intervention.

Analysis Scenarios

For each of the consumer profile cases, two cases of improvement in technical and operational performance were considered. In the high improvement case, the technical and commercial losses are assumed to be reduced by 60%, and 75% respectively. In the low improvement case, the technical and commercial losses are assumed to be reduced by 50% each.

In the high improvement cases, as shown in Annex VI, the existing situation corresponds to ranges of 42-224 million units per year for billed consumption and Rs. 10.2-63.6 crores per year for revenue. Implementation of distribution system improvements would result in energy savings of 9-49 million units per year and net savings of Rs. 2.7-15.4 crores per year. These savings arise due to increase in billed consumption due to reduction in commercial losses; commercial losses are mainly due to theft and metering and billing errors. Stoppage of theft and rectification of metering and billing errors will lead to increased billing, and hence higher revenue, but there will be no change in the energy input to the feeder) in the range of Rs. 0.7-3.8 crores per year, and decrease in input energy purchase cost (due to reduction in technical losses; this will lead to reduction in energy input to the feeder) in the range of Rs. 2.3-12.2 crores per year. The investment per unit of energy input varies between 0.7-1.8 Rs/kWh per year. The investment per unit of energy savings varies between 4.8-12.3 Rs/kWh per year saved, and the simple payback period varies between 1.5-4.2 years.

In the low improvement cases, as shown in Annex VI, the existing situation corresponds to ranges of 45-235 million units per year for billed consumption and Rs. 10.7-66.4 crores per year for revenue. Implementation of distribution system improvements would result in energy savings of 8-41 million units per year and net savings of Rs. 1.9-10.7 crores per year. These savings arise due to increase in billed consumption (due to reduction in commercial losses) in the range of Rs. 0.2-1.2 crores per year, and decrease in input energy purchase cost (due to reduction in technical losses) in the range of Rs. 1.9-10.2 crores per year. The investment per unit of energy input varies between 0.7-1.8 Rs/kWh per year.

The investment per energy savings varies between 5.7-14.7 Rs/kWh per year saved, and the simple payback period varies between 2.2-6.2 years.

This analysis indicates that depending upon the conditions in the urban area/circle selected, most distribution reform measures, when implemented as a package, would yield payback periods in the range of 1.5 years (best case scenario) and 6.2 years (worst case scenario). Furthermore, for most of the cases considered, the payback period is less than 4 years, which indicates that these projects are generally financially attractive. The analysis also demonstrates that the higher the load factor of the distribution system, the higher the energy savings and the lower the payback period.

The parameters and their ranges used for financial analysis are included in Annex VI. The construction period for urban area projects has been considered to be one year with partial savings beginning to accrue as partial implementation takes place and full savings being realized from the second year onwards. Accordingly, the moratorium for loan repayment has also been considered to be one year. The debt-equity ratio has been taken as 3, and interest rate on term loan between 8-14% with repayment period between 6-12 years.

Financial Analysis

Within the range of urban area projects, four cases were selected and detailed financial analysis was carried out for these cases. For these four cases, the payback periods were calculated to be 1.5, 2.6, 3.9 and 6.2 years, and the project financial internal rates of return (FIRRs) were found to be 98.4, 47.4, 28.1 and 14.5 percent.

The variation of debt service coverage ratio (DSCR) corresponding to different interest rates and loan repayment periods is shown in Annex VI. For the cases with payback periods of 1.5 and 2.6 years, the DSCR is higher than 1.5 even for financing at 14% interest for 6 years. However, for projects with payback period of 4 years, repayment will be required over 8-10 years for a term loan at 14% interest, and for projects with payback period of 5 years, repayment will be required over 12 years. For projects having payback period of 6 years, a term loan at 14% interest even with repayment over 12 years will not be serviceable. As shown in Annex VI, for the DSCR to be comfortable for such projects, financing at 8% interest with repayment over 12 years will be required.

The Team's analysis confirms that for urban area distribution reform projects, the payback period is generally less than 4 years for most of the cases considered. Hence, these projects can be financially viable with interest rates of 12-14% and repayment periods of 6-8 years.

B. RURAL AREAS ELECTRICITY DISTRIBUTION SYSTEM IMPROVEMENT

Key Analysis Parameters

For purposes of the Team's analysis, a rural area having an area of 200-250 sq. km. and a population of around 50,000 has been considered as a typical case. This could comprise a number of villages, and could correspond to one section within a distribution circle. The distribution system in such an area has been taken to typically comprise of (i) one 33/11 kV sub-station having 6 feeders of 11 kV level, (ii) approximately 150 km of 11 kV lines, (iii) approximately 450 km of LT lines, and (iv) approximately 150 distribution transformers. Other typical characteristics are shown in Annex VI.

The consumer mix in rural areas has been defined to include a mix of domestic and agricultural consumers. A total of 7 consumer profile cases were defined corresponding to different consumer density, consumer mix, and load density and load factor. These cases correspond to (i) ranges of 7,500-11,000 consumers, (ii) 9.7-18.0 MW connected load, and (iii) 18-65 million units per year energy input for the typical rural area being considered.

The following distribution system improvements for rural areas were considered for the purposes of this analysis:

- Conversion of LT lines to HT lines
- Reconductoring of HT and LT lines
- Replacement of bare conductor LT lines by insulated conductor lines
- Replacement of large 3 phase distribution transformers by smaller energy efficient 3 phase transformers for agricultural loads
- Single phase supply for domestic consumers, and meters at customer premises.

These would result in reduced technical losses and also enable commercial losses to be controlled. The range of costs for such improvements was assumed to be 10,000-20,000 Rs/kW connected load. For the cases considered, this corresponds to a range of Rs. 9.7-44.0 crores for the cost of the distribution reform intervention.

Analysis Scenarios

For each of the consumer profile cases, two cases of improvement in technical and operational performance were considered. In the high improvement case, the technical and commercial losses were assumed to be reduced by 75%, and 100% respectively. Savings from agricultural DSM were assumed to be 40%. In the low improvement case, the technical and commercial losses were assumed to be reduced by 60% and 75% respectively, and savings from DSM are taken as 30%.

In the high improvement cases, as shown in Annex VI, the existing situation corresponds to ranges of 11-40 million units per year for billed consumption and Rs. 1.0-2.1 crores per year for revenue. Implementation of distribution system improvements would result in energy savings of 7-30 million units per year and net savings of Rs. 1.2-7.1 crores per year. These savings arise due to increase in billed consumption (due to reduction in commercial losses) in the range of Rs. (-) 0.3 to 0.2 crores per year, and decrease in input energy purchase cost (due to reduction in technical losses) in the range of Rs. 1.7-7.5 crores per year. The investment per unit of energy input varies between 3.4-11.1 Rs/kWh per year input; the investment per energy savings varies between 7.3-29.2 Rs/kWh per year; and the simple payback period varies between 3.1-16.5 years.

In the low improvement cases, also included in Annex VI, the existing situation corresponds to ranges of 11-40 million units per year for billed consumption and Rs. 1.0-2.1 crores per year for revenue. Implementation of distribution system improvements would result in energy savings of 5-23 million units per year and net savings of Rs. 0.8-5.4 crores per year. These savings arise due to increase in billed consumption (due to reduction in commercial losses) in the range of Rs. (-) 0.3 to 0.3 crores per year, and decrease in input energy purchase cost (due to reduction in technical losses) in the range of Rs. 1.3-5.7 crores per year. The investment per unit of energy input varies between 3.4-11.1 Rs/kWh per year; the investment per energy savings varies between 9.6-37.8 Rs/kWh per year; and the simple payback period varies between 4.1-24.8 years.

This Team's analysis indicates that depending upon the conditions in the rural area/circle selected, most distribution reform measures, when implemented as a package, would yield payback periods in the range of 3.1 years (best case scenario) and 24.8 years (worst case scenario), a rather wide variation reflective of the rural sector in India.

It should be noted that whereas in urban area projects, there would be an increase in billed consumption which forms a revenue stream, in rural area projects, billed consumption could both increase or decrease. The decrease in billed consumption is due to decease in billed agricultural consumption which arises due to reduction in energy consumption because of agricultural DSM, and could also be due to changing from flat tariff to metered tariff in cases where consumption is low. Decrease in billed consumption reduces the net benefit from the project.

Another effect of reduced agricultural consumption would be that the subsidy received by the utility from the state government would decrease, thereby further reducing the revenue savings from the project, and considerably increasing the payback period. In this analysis, it is assumed that over the duration of the loan repayment period, the subsidy is maintained at the original level.

The Team's analysis concludes that rural distribution projects are very different from urban projects and may require a substantially different approach for distribution reform. The differences in urban and rural distribution reform are highlighted by the following results from the Team's analysis:

1. While investment per energy input is in the range of 0.7-1.8 Rs/ kWh per year for urban area projects, it is in the range of 3.4-11.1 Rs/ kWh per year for rural area projects, i.e. roughly about 5 times more.

2. Similarly, while investment per unit of energy savings varies between 4.8-14.7 Rs/ kWh per year for urban area projects, it varies between 7.3-37.8 Rs/ kWh per year saved for rural area projects, i.e. roughly about 2 times more.

3. Whereas the simple payback period varies between 1.5-6.2 years for urban area projects, it varies between 3.1-24.8 years for rural area projects.

4. Furthermore, the analysis concludes that the overall range of variation of these parameters for rural area projects is much more than for urban area projects. The range for investment per unit of energy input and investment per unit of energy savings is about 3-5 times. The range for payback period for rural projects is about 8 times than that for urban projects.

A further conclusion of the analysis is that for rural area projects, the lowest payback period is expected to be about 3 years under close to ideal circumstances. For most of the cases considered, the payback period is quite high and would be unacceptable. Only projects with investment per unit of energy input less than around 5 Rs/kWh per year or investment per unit of energy savings less than around 15 Rs/kWh per year would result in payback period being less than 6-7 years, which may be considered reasonable.

Annex VI shows the variation and the range of payback period corresponding to the energy savings per connected load expressed in terms of kWh per year of energy savings per kW of connected load. For rural area projects, energy savings per connected load varies between about 500-1400 kWh per year compared to about 200-450 kWh per year for urban area projects, i.e. about 2.5-3 times more. This is the reason why while investment per unit of energy input for rural area projects is roughly about 5 times more than for urban area projects, investment per unit of energy savings is roughly only about 2 times more. However, despite the much higher energy savings per connected load, the revenue savings are much lower for rural area projects because of the low tariffs.

Financial Analysis

Annex VI includes the parameters and their ranges used for financial analysis of typical rural distribution reform projects. The construction period for rural area projects has been considered to be two years with partial savings beginning to accrue as partial implementation takes place and full savings being realized from the third year onwards. Accordingly, the moratorium for loan repayment has also been considered to be two years. The debt-equity ratio has been taken as 3, and interest rate on term loan between 8-14% with repayment period between 6-12 years.

Within the range of rural area projects, four cases were selected and detailed financial analysis of these was carried out by the Team. For these four cases, the payback periods were found to be 3.1, 4.1, 4.9 and 6.0 years, and the project FIRRs were calculated as 37.5, 26.5, 20.7 and 15.3 percent.

For rural area projects, although the lowest payback period is seen to be 3.1 years, the payback periods would typically be around 5-6 years for the best cases. As discussed above for urban area projects, for projects having payback period of 5 years, repayment will be required over 12 years for a term loan at 14% interest, and for projects having payback period of 6 years, a term loan at 14% interest even with repayment over 12 years will not be serviceable. Hence, even the best rural area projects will require financing at lower interest rates and with longer repayment periods for them to be financially viable. As shown in Annex VI, for the DSCR to be comfortable for such projects, financing at 8-10% interest with repayment over 12 years will be required for projects with payback period of 5 years, and financing at 8% interest with repayment over 12 years will be required for projects with payback period of 6 years.

It should be noted however, that the above still is applicable only for the best cases. For rural area projects with longer payback periods, say up to 10 years, even longer repayment periods may become necessary. In such cases, amortization of assets over a longer period commensurate with their physical life of 25-30 years will need to be considered to enable coverage of debt service.

As mentioned above, it is assumed in this analysis that over the duration of the loan repayment period, the subsidy for agricultural consumption received by the utility from the state government is maintained at the original level. If the subsidy is reduced corresponding to the reduction in agricultural consumption, the payback period increases considerably. Even for the best cases, the repayment period would then need to be aligned with the physical life of the assets.

C. IMPLICATIONS FOR PILOT PROJECT SELECTION

Considering the extremely wide variation in the case of rural area projects, some guidelines for selection of pilot distribution reform projects are suggested below. These relate to the investment, the energy savings, and the revenue savings:

- As is seen from the above analysis, the payback periods are reasonable only in cases where the investment in terms of Rs/kW connected load is low. The investment required in a particular project will depend on the spread of the distribution system network and on its condition. The denser the distribution system with respect to the connected load (km of HT/LT lines/kW connected load), the more the likelihood of investment cost being relatively low.

- The cost for rural area distribution system improvement is significantly higher than for urban areas because of the following reasons:

    - The cost of pump sets replacement for agricultural DSM is in the range of 3,000-9,000 Rs/kW agricultural connected load.
    - The spread of the distribution system network is significantly higher in rural areas. The lower the density of the distribution system with respect to the connected load (i.e. higher km of HT/LT lines/ kW connected load), the higher will be the cost. In the cases considered rural areas have 6.8-15.4 km HT lines/ MW connected load and 20.5-46.2 km LT lines/ MW connected load, while urban areas have only 0.8-2.7 km HT lines/ MW connected load and 1.2-4.1 km LT lines/ MW connected load.
    - The condition of the distribution system in rural areas is typically poorer. Hence, system upgrade costs will be higher.
    - Additionally, modifications to and augmentation of the sub-transmission system (33/11 kV sub-stations, 33 kV lines) is greater in rural areas.

- As also seen from the analysis, the payback periods are reasonable only in cases where the energy savings per connected load of kWh per year are high. The kWh per year saved will typically be high only if the kWh per year consumed is high to begin with, i.e. the load factor should be high. This would be the case in situations where the share of agricultural consumption is high (or conversely, where the share of domestic consumption is low), and where pump set usage (hours/year) is high. Thus, areas where the cropping pattern is water intensive, and areas where surface irrigation is less would be areas that would be more suited. Furthermore, the higher the inefficiency of the pump sets population; higher will be the savings from agricultural DSM.

- Ultimately, it is the revenue savings that are important. In the case of rural area projects, the contribution of increase in billed consumption to the revenue savings is small and may even be negative. Thus, the revenue savings are essentially the savings due to avoided purchase of power. The higher the cost at which this energy is purchased, the higher will be the revenue savings. It should be noted that the term "avoided purchase" is with respect to the project. To the extent that this energy can be redirected elsewhere by the utility to other higher paying consumers such as industry, the revenue savings may be even higher.

- Even with a decrease or no increase in billed consumption, revenue savings can also be obtained through increase in tariff, which could be argued for as a quid-pro-quo measure for improvement in the availability, reliability and quality of power obtained as a result of the distribution system improvements. Even where there is a likelihood of this becoming possible some time after the implementation of the project, this would be important for the financial viability of the project considering the long duration of the repayment period.

These conclusions from the Team's analysis offer considerable information on the criteria to be developed in designing pilot urban and rural projects for a new potential USAID intervention. These findings are also confirmed by the recently released Distribution Policy Committee Report commissioned by the Ministry of Power and completed in March 2002.

V. ILLUSTRATIVE PARTNER ORGANIZATIONS AND EXPECTED RESULTS

A. ILLUSTRATIVE PARTNER ORGANIZATIONS

The distribution reform problem in India offers USAID the opportunity to design a targeted new activity and to partner with a large number of public and private sector partners at the Center and state levels. The amplified descriptions of potential partner institutions is provided in Annex VII.

Component 1 Partners

The potential partners as part of Component 1: National Distribution Reform and Alternative Financing may include the following:

The Ministry of Power and Other Central Power Entities: The GoI's Ministry of Power has overall policy and strategic planning responsibility for the development and growth of the power sector. In the MoP, the office of the Joint Secretary (Distribution Reforms) is responsible for the design, planning and implementation of centrally financed projects in a major shift from its earlier emphasis in the nineties aimed at augmentation of generation capacity, the MoP views distribution as the weakest link and hence requiring the greatest attention. It strongly advocates that any strategy to reform the power sector has to primarily focus on the distribution sector in order to ensure positive cash flows needed to make the sector creditworthy. A key program currently under implementation is the APDRP program introduced in early 2000 aimed at financing specific projects related to rehabilitation and modernization of the country's sub-transmission and distribution network. (See Annex 1) The APDRP Cell in the MoP will be a key partner for the implementation of interventions under Component 1 and shall also be a major beneficiary in terms of receiving USAID TA and training.

Public and Private Sector Financial Institutions: USAID may pursue discussions with various funding channels including two channels of funding with the PFC and the IDFC respectively. The implementation of a new activity by USAID contemplates seed funding to leverage APDRP and other resources through PFC to finance urban distribution circle modernization. Similar seed funding will also be needed for financing rural/semi-urban distribution circles through the IDFC.

Power Finance Corporation (PFC): The Power Finance Corporation, a financial Institution wholly owned by the Government of India, was established in 1986 dedicated to the development of the electric power sector in India. It is managed by a Board of Directors comprising a Chairman-cum-Managing Director, 3 full time Directors and part time Directors representing the Ministry of Power and Central Electricity Authority. The corporation's funding sources

include equity and accumulated surpluses (Rs. 3400 Crores), loans from Govt. of India, Domestic Market Borrowings (Rs. 3900 Crores) and External Market Borrowings (Rs. 2200 Crores). Certain of the corporation's borrowings from multilateral lending agencies (World Bank and the Asian Development Bank – Rs. 1500 Crores, as of 3/31/2000) are routed through the Government of India into PFC and finally to the borrowing entities.

The corporation provides full range of financial products (lease financing, bill discounting, working capital loans and guarantee services) to the domestic power industry for the full range of their operations (Renovation & Modernization of Power Plants, Energy Conservation Schemes, and System Improvements). The corporation also offers consulting/lender engineer services to the borrowers.

A vast proportion of the Corporation's lending activities are directed to the state-owned and state government sponsored entities. Private sector constitutes a very small portion of the Corporation's portfolio roaster. As of March 31, 2002, the corporation's loan portfolio stood at Rs. 13,300 Crores; funded mainly with (Rs. 8,237 Crores) unsecured loans, (Rs, 1080 Crores) secured loans and equity and retained surplus (Rs. 3,810 Crores).

PFC posted an impressive 19% growth in loan approvals to touch Rs. 7706 Crores during FY 2000-01. PFC reported a high Recovery Rate (of 99.5%) with no Non-Performing Assets in FY 2001. In the last five years, PFC reported an increase in Recovery Rate from 83% in 1994-95 to 99.5% in 2000-01,

Although not explicitly stated in any of its publications, the obligations of borrowers to PFC are implicitly guaranteed by the state (borrowing) governments. Likewise, PFC's obligations to its lenders (funding sources) are implicitly guaranteed by the Government of India (by virtue of the ownership of the corporation by Government of India). The sovereign backing on the funding and lending side explains the reliance of PFC on unsecured debt and the very high credit ratings it is offered by domestic rating agencies. The corporation's credit rating from international rating agencies (on its external private market borrowing), for obvious reasons, is at the rating of the sovereign debt rating of the Government of India.

Infrastructure Development Financial Corporation (IDFC): The Infrastructure Development Financial Corporation was established in 1994 as a professional body to help mobilize and direct private capital to commercially viable infrastructure projects. IDFC's capital structure includes (i) Foreign Financial Institutions (40%), (ii) Domestic Financial Institutions (20%), (iii) and the GoI (40%). IDFC's experience in financing power sector projects, primarily IPPs has been mixed. IDFC has now recognized decentralized infrastructure such as the "last mile" power distribution and distributed generation systems as an area of significant potential impact and returns. It has established a business unit called Decentralized Infrastructure & New Technologies (DINT), which operates on the

economic point of view that the cost of providing "the last mile access" in infrastructure remains the most expensive and difficult aspect of infrastructure development. IDFC believes that DINT could offer a vehicle to provide last mile access to good quality infrastructure while also stimulating local entrepreneurship and economic development. IDFC recognizes that the DR reform initiative being contemplated by USAID is at the developmental stage with a commercial orientation and will not be readily amenable to project financing because of the risks involved. A key risk is the absence of community-based structures in India. It has, therefore, shown considerable interest in partnering with USAID to reduce this and other risks through joint pre-development work.

Component 2 Partners

The interventions under Component 2: State Distribution Reform Planning will be at the state level as the state distribution companies (SEBs and Discoms) control virtually all of the power distribution in India. Potential partners for USAID as part of interventions under Component 2 should include a number of state level entities involved in the power sector. The principal partners could be the following:

State Ministries of Energy and Rural Development and SERCs: Most states have a Ministry of Energy and a Ministry of Rural Development. The Ministry of Energy has a direct oversight rule in establishing policy for the energy sector and has, therefore, a non-controlling supervisory responsibility over the SEBs and Discoms. The Ministry of Rural Development, although not traditionally involved, has a legitimate role to the extent rural development is linked to the availability of electricity in the rural areas. In recent years, a pattern is emerging whereby the Ministries of Energy and the Ministries of Rural Development have begun to coordinate rural development and rural electrification planning process. In some cases the ministries have sponsored joint programs for training in the linkages between rural development and poverty alleviation and rural electrification. Therefore these two ministries will be natural partners for USAID in designing interventions aimed at enhancing the overall institutional capacities of state level entities in areas directly relevant to power distribution.

State Electricity Boards and Discoms State Electricity Boards: Given that power is a concurrent subject under the Indian constitution, the States have a greater share of generation and transmission assets and almost the entire distribution sector under their control and exclusive responsibility. Distribution projects, therefore, call for a greater degree of mutual understanding and coordination between the Center and the States.

Component 3 Partners

The potential USAID partners under Component 3: Distribution Circle Pilot Project Replication and Outreach could include the following entities:

Distribution Circles: The distribution circle has been identified by the APDRP program as the administrative unit for the introduction of improved business management practices. Under any planned activity by USAID, the distribution circle will be a key partner and beneficiary. Briefly, the distribution circle represents a defined and manageable area, approximately covering a district, which caters to all categories of consumers in that area and is responsible for the collection of revenue from its customers. A typical SEB may consist of about 20-30 distribution circles and is headed by a Superintendent Engineer who is supported by 2-4 Chief Engineers, several Executive Engineers and Junior Engineers. Lower down are sub-station operators, electrical linesmen, meter readers, accountants and clerks.

Non-Governmental Organizations: A number of non-governmental organizations could also be strategically useful partners in not only pilot project design but also during the implementation phase. Many of the non-governmental organizations that may be suitable USAID partners for pilot projects in the urban sector have already been mentioned in the proceeding section, especially for distribution circle projects in the urban sector. Therefore, the discussion on potential partners in this section is focused on relevant institutions that are typically active in rural electricity distribution projects.

Rural Electric Cooperatives: There are at least two options for the selection of a pilot rural distribution reform project. First, the project could be selected in a rural area where a rural electric cooperative is already operating. In this case, this cooperative will be the most logical USAID partner. Alternatively, USAID may select a rural single or multiple feeder project as a slice from a distribution circle with mixed urban and rural load. In this case, USAID may consider expanding the pilot project design to include the development and restructuring of a new rural electric cooperative embodying key components of successful rural electric cooperatives elsewhere, such as in Bangladesh.

Franchises: Another model worthy of consideration could be the introduction of franchises for the delivery of rural electricity in predominantly rural distribution circles. Under such a scheme, for example, the SEB or the Discom could open the rural electricity sector to potential franchises. This would be possible only if an appropriate regulatory regime exists in the legal and regulatory provisions for franchises are well established.

Village Electric Committees (VECs): Other potential partners at the rural level could include Village Electric Committees (VECs) that play an important role in being excellent linkages between the distribution utility or the rural electricity provider and the rural consumer. Many of the states in India have village electric committees and once USAID has selected candidate rural distribution reform projects, an appropriate level of engagement with these committees will be crucially important. Such an engagement will have a great impact upon the

overall success of the selected pilot project. In addition, if designed carefully, this approach will also offer other tangential and important benefit such as capacity building of the committees, greater project credibility, increased consumer confidence through direct consumer participation and a high potential for replicating the success of the project.

Annex VI includes a more detailed description of potential partners and the roles they could play under a new USAID DR activity.

B. EXPECTED RESULTS

This section summarizes and highlights the expected accomplishments and outputs that could be realized from a targeted distribution reform activity in India. The following is a summary of expected outputs and accomplishments under each component of the project:

Component 1: National Distribution Reform and Alternative Financing

The following are illustrative results that could be achieved from targeted interventions under Component 1:

- Increased utilization of APDRP funds and leveraging of USAID investments towards distribution circle modernization in selected reform states
- Establishment of a national MIS system to monitor and verify APDRP program planning and implementation
- Reduction in state fiscal deficit as a result of reduced subsidies to cover SEB operating losses
- Creation of a alternative financing windows in Indian DFIs (e. g., PFC, IDFC), and other institutions for rural distribution projects in order to provide long-term debt and/or credit enhancement guarantees
- Adoption of specific risk mitigation measures across the DR lending portfolio within PFC and REC
- Enhanced overall institutional capacity leading to greater and more effective utilization of the APDRP funds
- Potential leveraging of USAID and APDRP funds with other funds even outside of public sector finance entities through greater synergy among parallel distribution reform initiatives by various donors
- More effective methods to design reform conditionalities and enhanced performance by states
- Better capability to allocate grants and loans to states based on actual achievements and more fair and equitable allocation of APDRP funds to different states
- More effective reporting and evaluation of reform results

- Enhanced capacity for MoP to seek outer year APDRP funding from the center based on actual performance, results, and documented needs
- Greater financial leveraging will open opportunities for more pilot project implementation and potential for private sector participation
- Innovative non-recourse financing schemes will create greater confidence in financial markets
- More DR and stronger financial conditions of the SEBs will reduce financial burden on the States
- Greater prospects for ad hoc designs, programs and practices to be replaced by more uniform systems

Component 2: State Distribution Reform Planning

The following are illustrative results that could be achieved from targeted interventions under Component 2:

- Reduction in high loss-prone feeders through systematic identification and feeder up-gradation programs
- Increased cash flow in selected utilities
- Passage of anti-theft legislation in the state parliaments
- Introduction of accounting and management practices and fiscal discipline
- Best practices for commercial operations of SEBs and Discoms
- Improvement in the reform contents of the memoranda of associations (MoAs)
- Enhanced monitoring and reporting of the progress on reforms
- Enhanced institutional capacity of SERCs in rationalizing tariff and licensing processes related to distribution reform
- More effective methods to design reform conditionalities and enhanced performance by states
- Improved financial management of the SEBs and the Discoms
- Improved technical skills to implement modern technology resulting in overall improvement in system efficiency
- Improved ability to develop, design, and implement additional distribution reform projects
- More effective social outreach and stakeholder participation resulting in educated costumers and, thus improved collections
- Better ability to pinpoint the reform areas with best payback prospects and, hence greater facility for targeting and prioritizing new investments
- A more targeted social outreach resulting in the reduction of both technical and non-technical losses
- Greater efficiency and transparency through the use of outside contractors and NGOs

- More self sustained systems through implementing successful rural electrification models such as consumer cooperatives, producer cooperatives, franchises, and NGOs
- Better prospects for mobilizing consumer "sweat equity" through direct consumer participation in electricity distribution
- Greater village level economic activity and income distribution leading to enhanced development of the rural sector through new rural industries

Component 3: Distribution Circle Pilot Project Replication and Outreach

The following are illustrative results that could be achieved from targeted interventions under Component 3:

- Increased implementation of metering, billing and collection within distribution circles
- Increased number of additional distribution reform projects implemented at the distribution circle, sub station, and feeder levels
- Increase revenues from the operation of systems as a result of the implementation of improved metering, billing, and collections
- Number of new distribution projects financed through creative financial leveraging mechanisms and the total amount of financial leveraging achieved by USAID
- Better utility-consumer relationship and enhanced consumer confidence
- Better quality and more reliable electricity availability to both urban and rural consumers
- Gains in energy efficiency as well as water use efficiency through extensive consumer education and social outreach
- Development of a more business-like climate, resulting in a more favorable climate for private participation in the distribution sector
- Enhanced environmental benefit through more efficient use of electricity
- Improved commercial performance at the distribution circle and feeder levels
- More uniform standards resulting in improved prospects for replication and economies of scale
- Improved utility/consumer relationships and greater consumer confidence
- Improved business climate leading to increased private sector participation
- Better ability to separate and target subsidy and improve customer service as a result of a modern consumer data base

The above list of accomplishments and outputs is illustrative. The actual outputs and accomplishments under each of the components may vary depending upon the rules of the various participating institutions and the interventions that may actually be implemented by USAID.

To a substantial extent the true success of any distribution reform intervention in India is closely linked to the political will and the institutional commitments of the leaders and managers in India. Given the severe financial crisis in the power sector and unattainable energy and financial losses, the government does not have many options except to promote distribution reform in an aggressive and sustained manner. The entire culture of electricity distribution and the role of participating central and state level stakeholders needs to be changed.

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INDIA ELECTRICITY DISTRIBUTION REFORM REVIEW AND ASSESSMENT

VOLUME II: ANNEXES

Submitted To

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New Delhi, India

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TABLE OF CONTENTS

ACRONYMS

AcCs	Advisor-cum-Consultants
ADB	Asian Development Bank
AP	Andhra Pradesh
APDP	Accelerated Power Development Program
APDRP	Accelerated Power Development and Reform Program
APL	Adaptable Program Lending
BEE	Bureau for Energy Efficiency
BIS	Bureau of Indian Standards
BSES	Bombay Suburban Electricity Supply Company
CERC	Consumer Education Research Center
CII	Confederation of Indian Industries
COP	Chief of Party
CPRI	Central Power Research Institute
CRISIL	The Credit Rating Information Services of India Ltd.
CRM	Customer Relations Management
DCA	Development Credit Authority
DISCOM	Distribution Company
DR	Distribution Reform
DSCR	Debt Service Coverage Ratio
DSM	Demand Side Management
E3	Office of Energy, Environment, and Enterprise
ECA	Energy Conservation Act
ECO	Energy Conservation Commercialization Project
ESCO	Energy Services Company
FI	Financial Institution
FIRR	Financial Internal Rate of Return
GDP	Gross Domestic Product
GEF	Global Environment Facility
GEP	Greenhouse Gas Pollution Prevention Program
GHG	Greenhouse Gas
GIS	Geographical Information System
GoI	Government of India
GW	Gigawatt
HT	High Tension
HVAC	Heating, Ventilation, and Air Conditioning
IBRD	International Bank for Reconstruction and Development
IC	Institutional Contractor
ICICI	Industrial Credit and Investment Corporation of India, Ltd.
IDBI	Industrial Development Bank of India
IDFC	Infrastructure Development Finance Corporation
IFCI	Industrial Finance Corporation of India
IL&FS	Infrastructure Leasing & Financial Services, Ltd.
IPP	Independent Power Producer

IR	Intermediate Result
IREDA	Indian Renewable Energy Development Authority
kV	kilovolt
kWh	kilowatt-hour
LOE	Level of Effort
LT	Low Tension
MP	Madhya Pradesh
M&V	Measurement and Verification
MoP	Ministry of Power
MNES	Ministry of Non-Conventional Energy Sources
MW	Megawatt
NGO	Non-governmental Organization
NPC	National Productivity Council
NTPC	National Thermal Power Corporation
OECF	Overseas Economic Cooperation Fund
PFC	Power Finance Corporation
PGCI	Power Grid Corporation of India
PMU	Project Management Unit
R&D	Research and Development
REC	Rural Electric Corporation
SBI	State Bank of India
SEB	State Electricity Board
SERC	State Energy Regulatory Commission
SGM	Sustainable Groundwater Management
SO	Strategic Objective
TA	Technical Assistance
T&D	Transmission and Distribution
USAID	U.S. Agency for International Development

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ANNEX I: MOP ACCELERATED POWER DEVELOPMENT AND REFORM PROGRAM

Mobilizing private sector investments in new generating capacity was one of the key objectives of the GoI during the early stages of the country's power sector program in 1993. For reasons summarized earlier, this reform program did not succeed. Due to the poor creditworthiness of the SEBs, many outside investors required sovereign guarantees from the GoI and/or the State governments to mitigate risks associated with non-payment. As a result, only 2.8 GW of some 56 GW of proposed power plants reached financial closure. In early 2000, the GoI shifted its reform strategy to focus on financially strengthening its state utilities (SEBs), which are the customers of any potential private investors. During the late 1990s, a few States began to initiate power sector reform initiatives, predominantly as a response by the states' political leadership to consumer pressure on the need to improve the quality, reliability and reduce the cost of service of power supply. The states of Andhra Pradesh, Gujarat, Maharashtra, Orissa, and Rajasthan have in fact succeeded in unbundling their respective SEBs and introducing commercial approaches to the operations of the unbundled distribution companies (Discoms).

Of these, Orissa is the only state that was able to initiate the transfer of ownership to private hands. Here too, a transaction that took over two years to be consummated has run into rough weather. The true extent of losses, and the investments required to restore health to assets/equipment was determined to be grossly underestimated. The Orissa case illustrates that privatization by itself is not sufficient for the sustainable viability of utilities. The legal and regulatory climate should afford the newly privatized utilities with protection under the law and allow the utilities to implement commercial operating practices such as policies of disconnection for non-paying customers and initiating prosecution of those responsible for theft.

Under the APDP scheme, the GoI disbursed Rs. 1,000 crores during the fiscal year 2000 - 2001 to various states, based on a demonstration by the states of achievement of specific reforms included under the APDP scheme. All of these funds were utilized for the upgrading of various distribution circles. During the fiscal year 2001 - 2002, the GoI allocated Rs. 1,500 crores for investments in the upgrading of 63 selected distribution circles and priority rehabilitation and maintenance of selected power stations. As of April 2002, only Rs. 426 crores was disbursed among the various states under this program. As a result, the remaining Rs. 1,074 crores has been shifted for disbursement during the fiscal year 2002 - 2003. In addition, the GoI has an additional budgetary allocation of Rs. 3,500 crores for disbursement to the states for the upgrading of distribution circles in addition to the 63 distribution circles prioritized during the fiscal year 2001 - 2002. The government plans to continue this reform process through the year 2012 with additional annual budget inputs. The program is being managed

by the Ministry of Power (MoP) in coordination with the NTPC and the PGCI. The NTPC and the PGCI are assisted by several Advisor-cum-Consultants (AcCs), all public sector organizations, such as the National Productivity Council (NPC), the Central Power Research Institute (CPRI), and others. A key component of the program is an incentive program to promote revenue increases by the utilities for actual cash loss reduction through matching grants.

The reform measures being considered as part of the APDRP include the following:

- Establishment of operational State Electricity Regulatory Commissions (SERCs)
- Specific steps towards tariff rationalization through proposals to the SERCs for setting up tariffs that reflect cost recovery
- Establishment of separate profit centers through restructuring of generation, transmission, and distribution and introduction of commercial operating procedures to make the system accountable and profitable
- Specific system improvements designed to improve customer service through the provision of reliable high quality electricity
- New initiatives aimed at improving the efficiency of both urban and rural electrification and disaggregating of rural electricity delivery through more efficient models such franchises, cooperatives, user associations, NGOs, etc.
- Introduction of modern and efficient metering, billing, and collection systems for all distribution circles with the ultimate objective to achieve 100 percent metering
- Promotion of demand side management and end use efficiency including comprehensive consumer education

In addition to the reform measures, the capacity building focus of the program includes specific interventions in order to strengthen the capacity of the SEBs and Discoms in managing a host of sector activities aimed at overall efficiency improvement and revenue collection enhancement. Specifically, some of the activities being contemplated under the APDRP include the following:

- Improvement in the data collection and analysis capacity of the SEBs and Discoms up to the 11 kV feeder level

- Approaches to commercial operation, specifically cost accounting and improvement in revenue collections through metering, billing, and collections

- Energy accounting, energy auditing, and technical loss assessment introduction

- System planning, demand forecast, network expansion planning, trouble call management, and centralized power supply monitoring and control system

- Project design, project management, and investment decision making

- Introduction of adequate management information systems and GIS-based mapping systems

Under the APDRP program, the GoI proposes to disburse funds through a combination of grants and loans to the various state governments. In the case of all North Eastern states, Sikkim, Uttaranchal, and J&K, all disbursements will be based on 90 percent grant and 10 percent soft loan. In the case of all of the remaining states, APDRP will finance 50 percent of the finance costs and the ratio of grant to loan will be set at 50:50. The remaining 50 percent of the funds will be provided through loans from the Power Finance Corporation (PFC) in urban areas and the Rural Electrification Corporation (REC) for rural areas.

The APDRP encompasses all key components of the power sector reform process and is a significant step undertaken by the GoI to leverage reforms at the state levels where the losses are the maximum and the opportunities for significant efficiency gains are the highest. At the same time, the APDRP program could be significantly enhanced in a number of areas as follows:

1. The experience during the fiscal year 2000 - 2001 indicates that the disbursement under the program was less than one half of the allocated funds. With the added emphasis on reform, it is expected that this disbursement rate will significantly increase. As the implementation of projects under the APDRP catches on, there will be much more need for additional funds in order to finance and implement high priority reform projects within all of the 454 distribution circles. Accordingly, there is a need to leverage APDRP funds with other funds with international donors in the near term and the private sector in the mid term as some of the SEBs and Discoms begin to become financially stronger and more credit worthy.

2. While the APDRP capacity component strongly focuses on enhancing the capacity of the utilities in a variety of areas, it could further benefit through a customer-driven approach to pressure distribution utilities to

accelerate the reform process. In other words, the distribution utilities should be encouraged to design and implement a variety of programs to increase consumer confidence and consumer participation. These include call troubleshooting, effective Customer Relations Management (CRM) programs, consumer education in the process of tariff rationalization, etc. Experience worldwide confirms that consumers must be engaged as an active participant for the reform process to produce the desired results.

The MoP has established a comprehensive management network for the implementation of the APDRP. Within the MoP, a power sector reform cell has been established which closely works with the NTPC and PGCI, the two nodal entities given the responsibility for working with the SEBs and Discoms in identifying and recommending various reform projects at the distribution circle level for funding under the APDRP. In addition, government supported research organizations have been recruited by the NTPC and PGCI as AcCs to provide training and technical assistance to the SEBs and Discoms in order to enhance their overall capacity. For financing the non-grant portions of the projects under the APDRP, the MoP has selected PFC and REC for financing reform projects at the urban and rural levels, respectively. While this is a comprehensive management system, it does not involve the participation of private sector entities that can often bring added management efficiency, accountability, transparency, greater consumer confidence, and a stronger public-private partnership to implement the reform process. Therefore, the APDRP program could benefit from leveraging its program management with private parties such as NGOs, private industry, etc. The involvement of the private sector, without a doubt, will add to the overall credibility of the APDRP and will significantly enhance the process of selecting the highest priority, and maximum pay-off, reform projects.

ANNEX II: USAID AND OTHER INITIATIVES

1. USAID Activities

USAID, under its E-Cubed Program is implementing a number of activities including the following:

- The WENEXA activity under ECO, which began in May 2002
- The IWRMB award for the Water Swaps study including matching 100K mission funds
- Nearer term possibility of programming the additional $4.7 million ESF/DA money for FY 2002 as follows:
    - Up to $1 million into ECO to support the ICICI Loan Fund as a potential funding source for one or more modules at Noida Power Company as a site for demonstration and training
    - Up to $3.7 million into a new DR project
- Longer term possibility of programming significant mission funds ($50 million) into a separate DR project
- Lessons learned from several mission activities, past and current, bearing on the DR strategy. These include:
    - Work being conducted by CORE International, Inc. as part of its USAID SARI/Energy Rural Energy Services Program
    - Work conducted by NRECA with the West Bengal Rural Electrification Corporation in planning and structuring a rural energy distribution utility managed and operated by local communities
    - Commercial and Technical Loss reduction strategies in urban and rural feeders conducted by NEXANT under ECO in Noida and AP (Hyderabad)
    - Load Research activity in Rajasthan, particularly on rural networks and opportunities on Agricultural DSM with Jodhpur Discom
    - Training module under preparation on Distribution Reform for IAS professionals by IIE
    - Report of the Distributed Generation Design and Strategy mission that visited India from Feb. 14-24, 2002

- Past and On-goIng Regulatory Reform Training Activities Related to DR

- Distribution Reforms Institutionalized Training at the PMTI

2. Multilateral, Bilateral and NGO/International Agency Programs

All key donors have been actively engaged in India's power sector. Some the following activities are directly related to power sector reform:

- World Bank aided State Power Sector Reforms in AP, Orissa, Karnataka, UP, and Rajasthan with major focus on introduction of commercial practices and distribution privatization in rural areas

- ADB aided State Power Sector Reforms in Gujarat and MP, specifically in Gujarat, on supporting in-farm water management in Mehsana district to reduce peak pumping power demand

- Proposed $140 million GEF supported grant to GoI to support the World Bank/India Global Climate Change partnership program. The program is expected to leverage a potential $2.25 billion IBRD credit line aimed at promoting energy efficiency and renewable energy development. Early indications are that the program will develop applicable projects worth US $110 million in the power sector to advance electric-motor pump set efficiency

- GTZ supported IGEEP project on Agricultural Demand Side Management in three districts in Karnataka; past DFID work at Nalgonda District, AP on Distribution Efficiency; past OECF pilot project on Distribution Efficiency at Warrangal District, AP

- World Bank/Government of Norway, AIJ project on Agricultural DSM in two districts in AP

- International Water Management Institute strategy for improving water and land resources management for food, livelihoods and nature with specific support to IWMI's research program around the theme of Sustainable Groundwater Management (SGM)

3. GoI/Indian Utilities' Activities

Key activities initiated by the GoI and selected private entities in India include the following:

- The Accelerated Power Development Program planned in 63 distribution circles in reforming states – support to the planning, design and execution of distribution efficiency in 2-4 distribution circles

- Distribution efficiency project at Noida Power Company planned under a four step modular approach and totaling $5 million. The project could be a venue for demonstration and training on distribution efficiency and reforms

- The National Hydrology Research Project for monitoring ground water resource use and its impact on district level power planning led by the Central Ground Water Development Board, Ministry of water resources

- Distribution improvement project through grass-root village community participation in operation, maintenance, billing and collection – planned and managed by Xavier Management Institute and BSES Ltd. in 4900 villages in Orissa and to be expanded to 19,000 villages under a phase 2 activity

- Pilot Project on Community Involvement in Rural Power Distribution taken up by XIM, Bhubaneswar under contract with KPTCL Ltd. In three talukas (Kaiwara, Budigere and Nonavinakere) in Karnataka

- Program on ESCO participation in Agricultural DSM programs including water conservation planned by Central Power Distribution Co. of AP in co-operation with equipment vendors, ESCOs and financing institutions

- Distributed generation program activities sponsored by MNES

4. Financial Institutions

A number of financial institutions in India are engaged at different levels with the GoI power sector reform process. A few examples are as follows:

- Development of Distribution Reform investment projects including agricultural DSM projects by the Infrastructure Development Finance Company (IDFC), as part of IDFC's reform-based program lending strategy

- On-going and planned line of credit operated by IREDA, IDBI and ICICI including refinancing through commercial banks such as BoI, SBI, etc. in areas related to energy efficiency and power distribution management

- Line of credit established by the Infrastructure Leasing and Financial Services (IL&FS)

These and other power sector reform initiatives emphasize both the GoI and donor strategies in addressing the power sector reform process and provide the rationale and a platform for USAID to design appropriate interventions in partnership with the Government of India.

ANNEX III: POTENTIAL FINANCIAL INTERMEDIATION APPROACHES – PFC and IDFC

1. Financial Intermediation for Urban DR Projects

The experience of the rural utility financing program in the United States, both in the public sector under the aegis of the Rural Electrification Administration (REA, now Rural Utilities Service, RUS) and in the private sector, suggests that it is possible to develop credit worthy entities starting from relatively modest beginnings.

During the early 1930s, rural electric cooperatives were incorporated all across the United States by individuals who banded together to facilitate rural consumers' access to central station power. The co-ops were initially capitalized with modest contributions from individuals. They typically had little or no management experience and more importantly, they had insignificant starting capital or equity. Without an equity cushion they were not able to borrow from traditional lenders to fund the development of their distribution systems. Bank and commercial lending sources were virtually closed to electric cooperatives.

The REA funded the electric co-operatives with debt capital to cover 100% of the cost of building distribution systems. The co-operatives purchased power from various sources and sold it through their distribution system to their members. REA instituted and implemented a comprehensive system of financial/operating controls, governance, and operating standards to guide the operations of the co-operatives right from the start and continued to do so (albeit with slightly relaxed controls as the conditions changed and cooperatives matured) during their growth. Co-operatives collected revenues sufficient to cover all of their costs – operating and debt service – and produced a small margin over and above their costs.

Over time, enough margins were accumulated in the electric co-operatives to build modest equity cushion – some 20% of their total asset base - by the mid 1970s. This equity cushion was sufficient to facilitate private capital to trickle into the co-operatives. However the capital flows were highly constrained and often came only in conjunction with REA funding. In most instances REA required private supplemental funding as a condition for lending. The co-ops organized a finance corporation, capitalized it in amounts sufficient for it to access capital markets and drew supplemental funding from that co-operatively owned entity. The co-ops' equity ratios improved on average to 40% or more. By the mid 1980s, the co-operatives had come of age. This equity level was considered "adequate" by private capital markets to provide direct access to the co-ops to capital markets. Co-ops that had the 40% or more equity cushion now had "direct access" to private markets. They could obtain credit ratings on their own credit strength and move from REA as well as their own co-operative finance institution to obtain 100% of their financing in the private markets. The

co-ops had cut off the apron strings to REA and other funding sources, and graduated to credit worthy entities with free and rapid access to private capital markets. The REA funding was gradually scaled back and co-ops moved to private sources based on the entities' own credit standing.

The Indian Situation

The Indian electric utilities are very different from a (start-up) cooperative in a physical sense. They represent fully operating and integrated supply and delivery systems with appropriate assets in place. Financially, however, the electric utilities in India are very similar to a startup cooperative - with limited or no access to capital markets on their own. The electric utility operations and finances in India are so intimately intertwined with governmental controls and policies – be it in management, supply of power or related inputs, rates charged to consumers or assuring access to power supply – that it is hard to distinguish government's credit with the credit of the electric distribution entities. In their present organizational and operating framework, electric utilities will not be able to obtain credit on their own. This situation is more acute in the distribution sector, as contrasted with generation sector, which can raise finances based on off-take of power by the distribution companies. Even in this instance, third party guarantees such as state or central government guarantees have been required to overcome problems with liquidity and the paying capacity associated with the entities that contract to purchase power from generators.

With the reforming of the power sector in India, in particular the distribution sector, all of this could change. Distribution companies are being formed across India in many states and they are beginning to generate financial statements comparable to commercial entities. The financial statements in most instances are, however, likely to be weak, representing either large receivables from government agencies or significant write-down of the asset base. Only in very select cases are the financial statements likely to be "clean" of overly burdensome debt. In most instances the distribution systems are also likely to be burdened with (universal) service obligations. In select instances, it may be possible to develop the distribution entities' operations to commercial standards – where revenues are generated from consumers to cover all costs and to generate sufficient margins over the obligations of the entities. It is not likely most of the distribution systems resulting from the current reforms will be "credit worthy" entities. In the Team's field visit, one of the best-run distribution entity reported not having "commercially comparable" financial statements ready even after 18 months of operation. Upon inquiry, the Chief Executive of the entity mentioned that there is no way his organization would generate cash flows to produce sufficient coverage to warrant an investment grade rating for its credit, at least not for a while. Only with sustained discipline, guidance and financing can these entities graduate to credit worthy commercial entities.

At the same time, the financing structures in place in India are not adequate to meet the credit needs of the emerging distribution entities. Distribution entities will continue to depend on state or central subsidies and cash infusion if transition is not made to commercial models. The current financing structures do not facilitate the move of newly emerging distribution entities on a road to credit worthiness. Further, credit availability is constrained by "term compression" (credit is available only for terms much shorter than what may be justified based on asset life or the term over which related tariffs are collected) and the need for third-party guarantees (implicit or explicit, as outlined later in this report). Alternative financing vehicles and structures can promote, in conjunction with the distribution reforms currently underway, the growth of the newly emerging distribution entities to credit worthy enterprises.

An Alternative Financing Vehicle

During the field visit, the Team was told that improvements in the distribution sector in India required management inputs and that funding was not critical for the distribution reforms. Although management inputs are key for distribution reforms to take hold, a review of the distribution infrastructure and distribution plant during the site visits made it abundantly clear that large investments will be needed in the distribution plant for the distributions systems to be made safe, reliable and uniform, as well as to reduce losses and the vulnerability of the system to theft. In some cases, the distribution systems had unsafe fixtures. There were significant variability (in designs, appearance, etc) from one location to another but some elements are worth mentioning. The proximity of the live wires from dwelling units literally at a hand shake away from residential structures, improvised fixtures such as PVC sleeves dangling on live wires and poorly installed drop wires and junction boxes were in evidence all over. The capital expenditures required to address these problems with internal generation of cash in the newly formed distribution companies/circle appears to be a remote possibility given the already strapped cash situation at the distribution companies.

Based on meetings with the financial institutions such as the Power Finance Corporation (PFC), the Infrastructure Development Finance Corporation (IDFC) and the Infrastructure Leasing Finance Services (ILFS), it is clear that:

- Much of the financing hitherto into the power sector was based on project based funding and lending
- Financing, or at least a large majority of it, relied on the third party guarantees
- The term of the financing is typically short – much less than the asset life, often less than the length of multilateral funding/grants – reflecting perhaps the short term-structure available in the Indian debt markets
- Corporate credit development or reliance was quite limited.

Based on this assessment, the Team concluded that one of the Component 1 interventions could be to help with the development of alternative funding/lending mechanism to support broad distribution reforms.

A proposed lending mechanism, illustrated in Exhibit III-1, involves developing a channel of funding/lending in an organization adjunct to PFC, the IDFC or another appropriate institution. The following narrative outlines the proposal through an adjunct to the Power Finance Corporation – christened as PFC-X. The initiative contemplates seed funding and continuing funding from outside sources to PFC-X, a separate and distinct segment of the PFC, and lending directly to the potential borrowers (as opposed to looping the debt through State Electricity Boards, State Treasury or other governmental agencies). Some of the significant features of the proposed lending/guarantee mechanism include:

- Lending from PFC-X will be based on the corporate strength of the borrower rather than reliance on third-party guarantees

- The term structure of the lending from PFC-X will be for terms to match the life of the asset, defined as the length of the time over which the assets will be paid for by the customers, or the term of the funding source

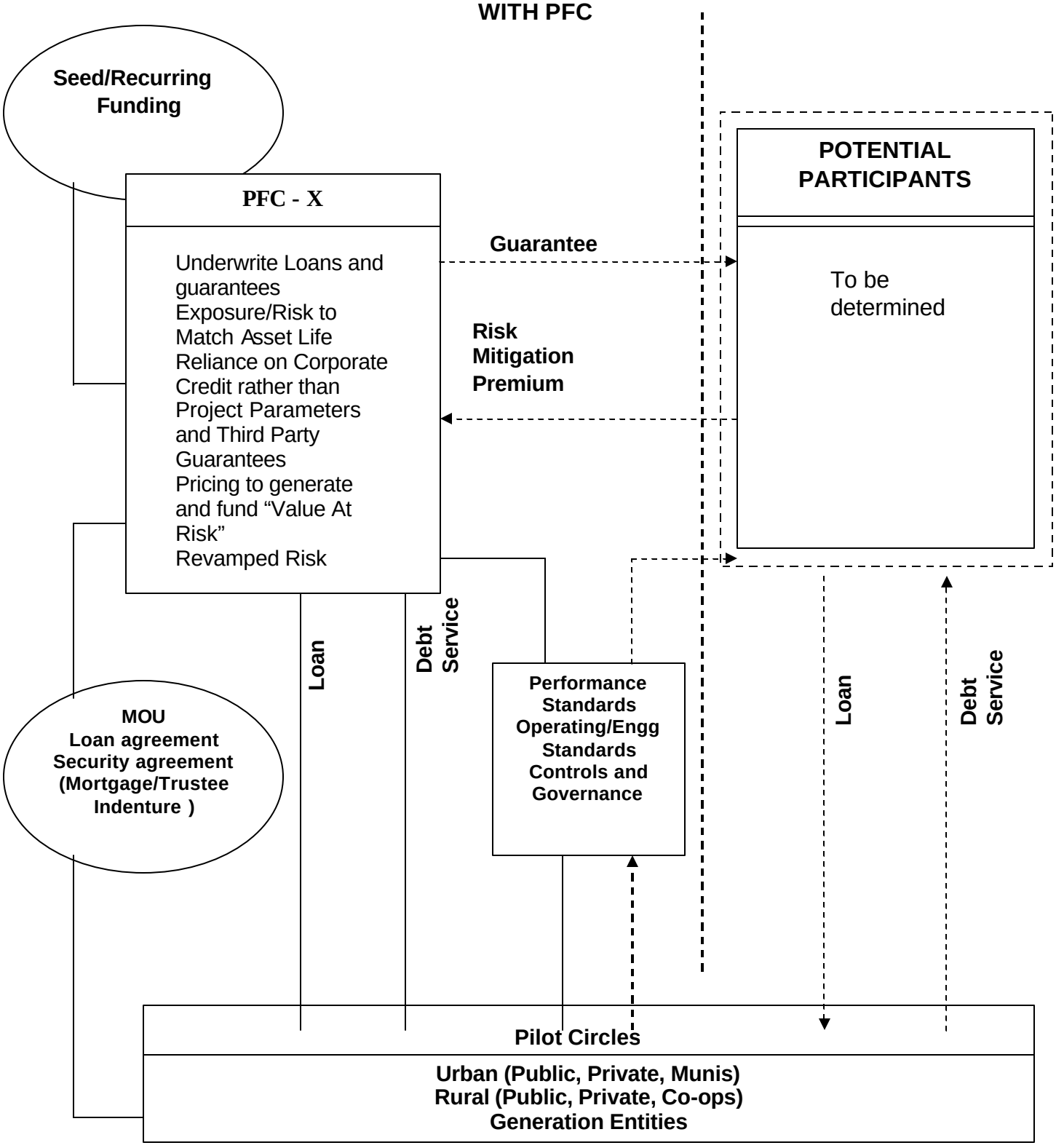
- The terms of the lending will require reporting and monitoring of the corporate operating and financing performance parameters

- Pricing or the interest rate on the loans will involve collecting a specific premium to collect the "value at risk" in the lending activity

- Risk Mitigation Measures will be specifically adhered to

The initial/core funding could come in the form of grants, equity investment or subordinated debt from the parent PFC or other entities (such as the Government of India, interested financial institutions, multilateral aid and funding institutions, etc.). The size and timing of the initial funding will have to be sufficient to enable PFC-X to raise additional capital from the market – on a non-recourse basis – to initiate and continue its funding/lending operations. Assuming a debt equity ratio of 4:1, and an initial average loan volume of Rs. 200 crores per loan and 25 loans in the first year of operations, the core funding need could be in the range of Rs. 1000 crores.

EXHIBIT III-1: ILLUSTRATIVE FINANCIAL INTERMEDIATION WITH PFC



The loans/guarantees from PFC-X could be based on a mortgage/indenture on the assets/entity financed, a memorandum of understanding and a loan agreement. The terms of the instruments could reflect as closely as possible, commercial terms to enable PFC- X to use the security instruments as the basis for its continued funding operations (such as the ability to raise money in the commercial markets on the strength of its portfolio, rather than reliance on a guarantee from a third party such as the Government of India). The terms could also include, to the extent practicable, the risk mitigation features outlined here under and the operating/engineering controls PFC-X should seek to obtain in consideration of the non-recourse financing it could make available to the distribution entities.

The proposed lending activity could involve a requirement on the part of borrowers to adhere to performance, operating/engineering and governance controls to be overseen and exercised by PFC-X. This would ensure that the distributions systems, going forward, will follow standards that improve the safety, reliability, and vulnerability to pilferage that the distribution systems seem to suffer from.

In the longer run, PFC-X can graduate into an institution that offers a Guarantee Program as well – as shown in the right hand side of the diagram with dotted lines representing the various relationships, cash flows and transactions. The guarantee program can only be initiated following a demonstration of the strength of PFC-X, its portfolio and operations. Some of the advantages of the guarantee program include:

- Ability to leverage the equity and funding sources through off-balance sheet financing (leverage can be increased from 4:1 to 8:1)

- Seeding and growing of potential participants who analyze and underwrite loans, take an unsecured position and rely on an unconditional partial or full guarantee from PFC-X

- The guarantee provides for a timely payment of principal and interest to the participant, when due and when the borrower fails to make timely payment – not an acceleration of the principal owed

- Ability to generate fee income for PFC – X from the “Risk Mitigation Premium”

Based on the accumulation of the risk mitigation premium and margins over the cost of operations, PFC-X can grow and develop into a self-sustaining organization, independent of PFC and driven mainly by the commercial requirements of the market place.

Risk Mitigation Measures

Risk mitigation can be accomplished by implementing specific covenants as well as by adopting practices and policies designed to monitor and enhance the credit quality of the portfolio of the lending entity. One of the ways for PFC-X to mitigate its risks is to follow commercial lending practices and institute systematic compliance mechanisms. Some of the risk mitigation measures PFC-X could adopt are:

- Adaptation and implementation of limits on single obligor exposure – credit concentration policies
- Build-in loan loss allowance into pricing and build loan loss reserves
- Underwrite loans as pre-sold (syndicated) with a view to participate-out and lay off exposure in secondary markets
- Constantly review and update underwriting practices and the loan process to improve underwriting standards
- Institute independent and rigorous compliance function
- Risk-rate borrowers and set limits on exposure to each category of rating and weighted average risk rating of the total portfolio
- Consider differential pricing
- Offer interest rate discounts for improving financial parameters
- Build-in debt service reserve funds
- Tie-up revenues from specific sources/designated accounts to cover some or all of debt service
- Impose restrictions on additional borrowings/or require lender approval
- Subject appointment/change of key staff to lender approvals
- Require submission of annual budgets and strategic plans
- Conduct due-diligence reviews and field visits on periodic basis
- Categorize borrowers by risk ratings and follow-up risk categories more frequently
- Develop and adopt engineering standards
  Develop and prescribe accounting standards germane to the industry
- Develop, measure and monitor key operating ratios
- Develop and use a uniform reporting system – supplement traditional accounting approach
- Develop and use uniform loan and security instruments – mortgage, loan and security documents

Key Operating Ratios

Risk mitigation in lending operations is critically dependent on measuring and monitoring key operating indicators of the businesses that are financed. This is especially important for long term institutional lenders that depend on sound operations of the borrowers to maintain the institution's own credit standing. The measuring and monitoring of most business enterprises can be accomplished in most instances by reviewing the annual audited financial statements. However, for electric utility firms, accounting measurements alone do not adequately measure the operating efficiencies and underlying credit fundamentals. Service area economics, demographics and operating efficiency are critical to the financial well being of electric utilities. Following are some of the suggested operating indicators that can be used to monitor the individual electric utility borrowers as well as to compare them across the borrower population:

- Revenue per Kwh sold, by class of customers
- Cost of purchased power per Kwh
- Percent sales (Kwh, Rs) by end user category – residential, commercial, industrial, irrigation, street lighting, etc.
- Line loss % by voltage level
- Hours of service interruption by class of customers
- Employees per customer
- Overtime paid (Rs) and Overtime per employee (Rs/employee)
- Accounts receivable and current ratio
- Bad debts as % of Revenues
- Number of disconnections, new connections
- Number of customers per mile
- Number of customers regularized (illegal connections)
- Growth of consumption (Kwh) by customer class
- Customer complaints per 1000 customers served
- Distribution adder per Kwh sold
- A&G Expenses per Kwh sold
- Times Interest Earned Ratio (TIER)
- Debt Service Coverage Ratio (DSC)
- Equity as % of total assets, Equity as % of total capitalization
- % Capital expenditures funded by internal cash generation
- Average cost of debt capital

These and other similar indicators can be compiled and compared across time periods for the same borrower and across all borrowers to benchmark performance as well as to measure changes in performance over time for a given borrower.

Linking of the Component 1 Initiative with the Component 2 and Component 3 Activities

If the proposed funding/lending concepts find favor with relevant financial institutions (such as PFC, IDFC and REC), it is contemplated that USAID would design specific activities in the next phase of this project to advance the funding/lending concepts outlined here and designate specific interventions at the Component 1 and link them to the Component 2 and Component 3 initiatives. For example, Component 1 intervention could involve training and technical assistance to personnel at other levels – staff in the PFC and financial institutions, Ministry of Power, NTPC, etc. (Component 1), staff at the state and incumbent utilities (Component 2) and principals associated with individual projects (Component 3). Another Component 1 initiative could be to facilitate co-operative arrangements with/between counterparts in India and the US at various levels. This initiative can take the form of facilitating a Memoranda of Understanding (MOU) between Indian and US counterparts, for example, between and US Rural Utilities Service (formerly REA), US private sector financial institutions, and the Indian financial institutions in Component 1. This initiative can also facilitate cooperation between related organizations like the National Association of Regulatory Utility Commissions (NARUC), Federal Energy Regulatory Commission, and other US organizations and their Indian counterparts (Component 2). The Component 1 initiative could also involve direct and indirect financial inputs by USAID to facilitate the initial steps in setting up of the PFC-X.

The interventions at Component 1 are closely linked to the Component 3 initiatives by the funding needs for specific Component 3 projects. Financing for Component 3 initiatives could be facilitated through funding from PFC-X (through a Component 1 initiative). For example, the formation of a cooperative and transfer of distribution assets/franchise area away from the incumbent distribution circle could require financing from the PFC-X for all (or a portion of) funding that will be required by the sponsors of the Component 3 projects. USAID funding commitment to the initiative at Component 2 may be simply not sufficient to fully implement the initiative. Thus it is important to note that the Component 1 initiative is an integral and essential part of the USAID interventions at the Component 3.

2. An Example of Financial Intermediation for Rural DR Projects

Distribution reform measures initiated in the Power sector in several states in India are progressing very slowly. The non-viability of rural distribution and the absence of any clear solution to change this situation are affecting the pace of reforms in the entire sector. Given (i) higher levels of perceived and real risks, (ii) the relatively small size of rural projects, and (iii) a lack of institutional infrastructure in the rural sector, neither private investors nor the existing public utilities have an interest in the implementation of distribution reform in the rural

sector. Given the size of the rural load and the unique challenges that prevail in the sector, these impediments need to reduced and eventually removed through targeted interventions.

As part of designing the most appropriate interventions, one needs to appreciate the complexities associated with rural distribution reform. Urban and rural power issues need vastly different solutions given the associated investment risks, the management and institutional challenges, and the financial returns incentives required to attract the most effective management and investment. Existing institutional structures lack the capacity to address the complex rural power distribution challenges.

The key constraints facing the rural sector are lack of metering, poor collections, poor quality and reliability of power, lack of consumer service, a virtual absence of consumer participation leading to a lack of consumer confidence, and excessive political influence. These problems lead to low voltage and limited-hour supply, wasteful practices, low system maintenance resulting in high breakdown and default, and significant commercial losses.

In addition, the farming sector has its unique problems that result in oversize pumping and poor water storage, lack of payment, poor confidence in utilities, and wasteful use of water. Therefore, any rural distribution reform initiative should not only address the agriculture tariff rationalization but also focus on designing incentives for key stakeholders, especially users. Such an initiative should included carefully designed interventions that address multiple risk-sharing participants. A framework involving public, private and community partnership has been practiced in many countries and may offer good lessons for intervention design for rural distribution in India. Some of the components in any rural power distribution should include the following:

- Development of incentives to the rural users in order to facilitate their participation in efficiency improvement initiative

- Development of creative institutional structures and entities such as cooperatives, franchises, etc. to facilitate consumer participation in distribution and commercial aspects of managing such entities

- Outsourcing of certain activities such as metering, billing, and collections in order to introduce more accounting transparency and efficiency and a more commercial culture in the management and operations of rural electricity delivery entities

- Well designed social intervention, consumer education, and communications and outreach strategies and program, at the local level by mobilizing the participation of user groups, village committees, and NGOs

- Targeted training programs aimed at skills upgrading, social interaction, and attitudinal changes

As mentioned earlier, IDFC has been very active in focusing on a creative approach to influencing rural distribution reform. Exhibit III-2, developed by the IDFC and incorporated here, illustrates a model proposed by the IDFC that embodies the key complexities of rural distribution. The key factors include the following:

- **Social Intervention and Consumer Participation:** Local user involvement through user committees for effective communication with the users regarding the benefits of the initiative, the need for metering and controlling theft, improvement of energy use efficiencies, better customer services, and compliance on billing and collection

- **Capacity Building of Local Employees/Users:** Adding value to employees through training and skill upgrading to remove fears and uncertainties that plague employee/user behavior and attitudes

- **Customer Complaint Resolution and System Management:** Prompt service and efficient substation management are key to improving reliability and availability. Customer satisfaction would be a major influencing factor in user compliance on metering, bill payment and DSM

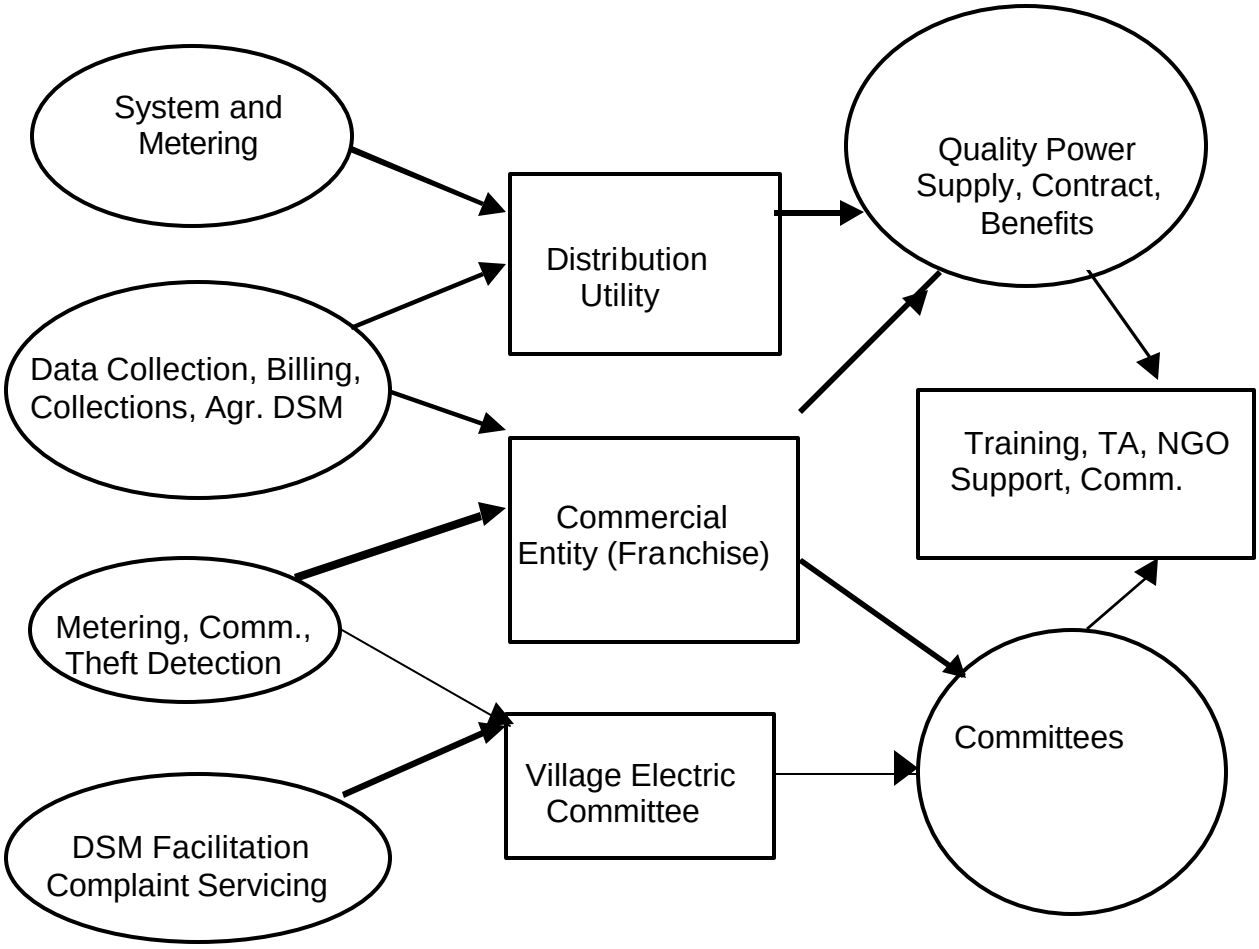
- **Investment in System Technical Improvement:** Investment is required to reduce the high technical losses in distribution from 20-50% to much lower levels VAR correction and introduction of LT-less system. The substantial saving in input power, would, along with other DSM measures, would reduce the overall investment requirements and make rural projects more attractive.

- **Individual Consumer Metering:** Metering actual consumption (i) reduces wasteful usage practices, (ii) reduces demand and system overloads, (iii) makes system management less difficult, (iv) helps avoid disguised theft and helps in targeting subsidies, and (v) assists with locating and eliminating points of power loss

- **Improving Commercial Efficiency through Effective Billing and Collection:** System improvement and supply quality improvement without ensuring proper compliance on bill payment would only lead to larger losses to the rural electricity providers, since consumers are bound to increase consumption in the absence of accountability. Hence, while system improvement is carried out, a simultaneous effort on proper billing and collection are required to fully capture its gains

- **DSM Investment and Implementation in the Agriculture Sector:** The inefficiency in agricultural pump sets due to overrating and poor quality of windings, foot-valves, piping, etc. is well known and results in huge financial losses to the utilities. Estimates of the power that can be saved by using efficient pumping systems varies from 20% to 50% of present consumption levels. However, any change in the pumps requires a good quality of supply and steady and standard voltage. Another pre-requisite is to convince the farmer that changing the pump would still provide the required amount of water and would result in economic gains.

EXHIBIT III-2: POTENTIAL MODEL FOR FINANCIAL INTERMEDIATION FOR RURAL DISTRIBUTION PROJECT FINANCING



Agricultural Consumer
Domestic Consumers
Some Industrial/Commercial Consumers

The IDFC model aims at facilitating the SEBs and Discoms in the management of rural electric distribution systems through creating local (entrepreneurial) administrative structures, typically in the form of Village Electric Committees, (VECs), which would represent a cluster of consumers. Franchisees could provide the role of the intermediaries between the utilities and the VECs (the consumer representative).

The potential benefits of an effective rural electricity distribution reform initiative include (i) financial benefits, (ii) saving in Input power purchase costs at an increasing average purchase rate every year, (iii) lower transmission losses (local generation), (iv) lower distribution losses (LT-less, VAR corrections), (v) lower agriculture sector consumption (Agriculture DSM), (vi) reduced domestic consumption (Metering), (vii) lower T&D losses due to lower consumption (loss on avoided consumption), (viii) better revenues through higher billing & collection at present tariffs and higher collection in outer years as tariffs are increased, etc.

Other benefits would include more satisfied consumers, better overall staff capacity and skills, targeting of and reduction in subsidies, sector reform and greater village level economic activity.

Risk Identification and Mitigation

There is a number of inherent risks associated with rural distribution reform. These risks are a direct result of a lack of buy in from the utilities, policy makers, and regulators. In addition, a lack of experience with targeted financial models increases financial risks. Some of the key risks are listed below:

- Distributed generation needs encouragement without burdening the utilities (e.g., competitively bid renewable energy projects with third party sale of power permitted in the event of default)

- Revenues of the franchisees could be based on an ESCO model (i.e., a pre-agreed share of net benefits generated from the project). The conventional 16% return on investment criteria would fail to reward the managerial inputs and the investment risk taken by the private investors in these ventures.

- Supply risk, power availability for quality/reliability of supply, franchisee performance risk, management capability (social, technical, commercial), utility support risk, sharing of Investment, need for assured payment for private investment based on performance, political/social interference risk, and others.

Based on the above, there is a real need to design a tailor-made financial intervention by USAID to demonstrate one or two rural distribution reform pilot projects. USAID and IDFC are discussing a number of options such as (i) grant funding for pre-design work, (ii) establishment of a revolving fund, and (iii) establishment of a loan guarantee fund for selected pilot projects with the best prospects for replication.

ANNEX IV: ILLUSTRATIVE APPROACHES AND DESIGN RATIONALE FOR COMPONENT 2: STATE DISTRIBUTION REFORM PLANNING

Huge losses have made the SEBs financially insolvent with huge liabilities to the Central government. In summary, the following facts provide the context of the seriousness of electricity distribution problems throughout India. It is this context within which any new DR interventions should be designed:

1. The SEBs and Discoms are responsible for distributing 97 percent of the electricity in the country. Only 3 percent of the electricity is distributed privately. The 40/50 percent distribution losses are simply untenable.

2. The SEBs are in poor financial health as a result of decades of negligent management/operational practices, especially a lack of metering, billing, and collection. This is further complicated by little or no investment in system upgrading, maintenance, and rehabilitation, and a generally poor morale and capacity of thousands of technicians and workers.

3. Together the SEBs have accumulated Rs. 414.7 billion in dues to central public sector units such as NTPC, NHPC, Coal India, Power Grid, the Damodar Valley Corporation and Nuclear Power Corporation. The Montek Singh Ahluwalia report submitted recently to the MoP concluded that these dues have arisen because of the basic inefficiencies and nonviability of the SEBs. The report states --"*A settlement of past dues alone will not solve the basic problems facing the SEBs; unless the problem of current nonviability is speedily addressed, over dues will mount again*." Keeping this in mind, the report has suggested that the settlement of past dues should be linked to a mechanism that will ensure that the SEBs are in a position to pay their dues in the future. To ensure this, it is absolutely necessary that some commercial discipline is enforced and reforms and restructuring programs are taken up to turn the SEBs into viable entities.

4. A number of technical and system problems also plague the performance of the SEBs. There are widespread frequency fluctuations which cause tripping in the system as well as damage to the end-user equipment. The nominal frequency is prescribed at 50 Hz. The actual frequency delivered is as low as 47 Hz in the dry season and over 52 Hz during the monsoons, a difference of almost 5 Hz. In most developed countries, the frequency deviation is 0.5 Hz or lower. Moreover, the voltage at which the power is supplied is always lower than it should be. This again damages the end-user equipment and necessitates expenditure on voltage stabilizers, a common equipment in most urban households and businesses. Quite often, the voltage in the domestic sector is well below 220 volts, dropping as low as 150 volts. The voltage in the EHV segment is also generally below the prescribed 400 kV, dropping as low as 300 kV.

The low HT: LT ratio is another major problem. India has a HT: LT ratio of about 1:3 as against a ratio of 1:1 in most other countries. The technical losses tend to be much higher in the LT segment. Moreover, theft and pilferage through tapping directly into the feeders is much easier in the LT segment. The sub-transmission and distribution system is also sub-standard. The load management is poor or non-existent. The demand is not regulated through means of time-of-day metering and pricing, causing under-frequency problems. The intra-state grids are also affected by the inter-SEB problems. The SEBs generally do not conform the grid codes/practices, often overdrawing and causing grid failures. There are no standards that have to be adhered to, only recommended guidelines. To make matters worse, there is no organization with the authority to supervise and penalize.

A major problem is the low level of automation. The load dispatch process in most states is not automated. This lack of computerization leads to inefficient real-time data collection, control, and monitoring. The net result is sub-optimal planning and wasteful use of electricity. The low level of use of information technology extends further to meter reading, invoicing and collections. This results in inaccurate billing and high receivables.

5. On an aggregate basis the combined financial performance of the SEBs can be summarized as follows:

    - The SEBs had a total of 506 billion units of electricity available at the busbar. Of this amount, 362 billion units of electricity was distributed to agricultural and domestic consumers, with some inter-state transports. The remaining 144 billion units of electricity was distributed to industrial, commercial, and railway costumers. A total of 64 percent of the electricity sold to the domestic and agricultural customers generated 38 percent of the revenues, whereas the remaining 36 percent of the electricity sold to the industrial and commercial consumers and railways generated 62 percent of the total revenues.

    - The total transmission and distribution losses amounted to 168 billion units or Rs. 345 billion. Of this amount, commercial losses stood at Rs. 202 billion. Also a total of Rs. 473 billion was the amount of subsidy to agricultural and domestic customers.

    - These figures clearly illustrate the serious financial condition of the SEBs. They also demonstrate the sizable cross subsidy from the industrial and commercial customers mostly located in major urban areas to domestic and agricultural customers in rural areas. This

pattern has to be turned around in order for India's power sector to become healthier.

- Within the domestic and agricultural sector, the total supply cost was Rs. 347 billion. Un-metered supply and theft were estimated at Rs. 259 billion; the gross subsidy was Rs. 251 billion and the overall distribution efficiency was approximately 34 percent.

6. Operationally, the SEBs continue to be poorly managed with productivity close to a third of that in the West. Also, analysts have estimated that productivity at the SEBs is approximately 27 percent. This low level of productivity is a direct result of a number of factors including poor organizational practices, over staffing, inefficient utilization of manpower, and a virtual absence of human resources development (HRD) and human resources management (HRM) programs.

7. The situation is further complicated by uncontrolled electricity theft, non/payment, and routine political interference, with the net result that consumer confidence in the SEBs is at a very low level. Therefore, the reform of the SEBs is the biggest challenge that faces India's power sector planners and managers.

8. The poor financial condition of the SEBs has not only resulted in a poor electricity sector but has also begun to threaten the financial conditions of the various states. It is for this reason that the MoP has devised the process of linking any financing under the APDRP scheme to specific power sector reforms through individually designed memoranda of association (MoAs). Through this process the central government hopes to influence and even mandate distribution reforms at the SEBs and Discoms to the extent they will depend upon APDRP funds for financing selected distribution reform projects at the circle and feeder levels.

9. In most of the SEBs, there is a virtual absence of any serious customer relations management (CRM) program. As a result, thousands of customer complaints largely go ignored resulting in a very poor customer confidence. Furthermore, the poor quality and reliability of power supply adds to this low level of customer satisfaction. In addition, there are no mechanisms through which consumers can participate in any of the planning and management functions of the SEBs. For rural customers, the problem is even worse as they are far removed from the overall chain of electricity supply and distribution.

10. The issue of sector governance at the SEB level continues to be a major challenge. The monopolistic nature of the SEBs since the 1950s had resulted in (i) a lack of transparency and accountability, (ii) a shift of costs of social welfare from the rate-payer to the tax-payer, (iii) a lack of

relationship between tariff and collections to the cost of supply, (iv) and an overall lack of investment needed for even the basic needs of system upgrading and maintenance. This patron continues to be the normal state of affairs in most SEBs except in the case of some of the States that have begun power sector reforms, such as Rajasthan, Andhra Pradesh, Karnataka, etc.

11. Despite this gloomy performance of the SEBs there are a few excellent success stories where creative solutions to sector reform have resulted in impressive results. A few examples are summarized below:

- In Andhra Pradesh, 2 million domestic consumers and 300,000 agricultural customers have been regularized. As a result, the collection efficiency has reached close to 100 percent. In addition, this state is the first state in the country to implement a tough law to control electricity theft. The implementation of this law is resulting in a five fold increase in the prosecution of power thefts.

- The State of Rajasthan has implemented technical solutions in order to enhance the utility's ability for metering, billing, and collection. The state replaced over two lakh old meters with high accuracy electronic meters within a six month period. This has resulted in significantly higher collections. The state now plans to install an additional 5.5 lakh electronic meters over the next six months.

- The State of Maharashtra took a different approach and initiated a drive to disconnect non-paying customers. During the past six months, the state has disconnected over 1.5 million households. The Maharashtra SEB has also taken the initiative to relocate a large number of non-paying government officials to different zones in order to segregate non-payment due to corruption from that due to theft.

- The Tamal Nadu State has identified over 150 areas with a high incidence of power theft by industries. The state took specific steps to bring down the losses. The state has prosecuted several thousands power theft cases. In addition, there is a plan underway to install new electronic meters particularly in areas with high theft.

- The State of Gujarat has begun the implementation of 450,000 new meters at the cost of over Rs. 550 million.

The above are just a few examples that demonstrate the results of a strong political will combined with tough management decisions in order to curtail distribution losses within the SEB system. There are several examples in the private sector, such as the experience of the Noida Power Company, and BSES, which also offer clear evidence that distribution reforms can be achieved if there is a political will to transform distribution utility management to a commercial orientation and educate consumers to increase consumer willingness to pay for electricity used.

12. The state distribution utilities face even more formidable challenges in serving rural customers. Rural electricity distribution networks are often implemented to meet political and social objectives rather than on the basis of sound economic principles and least cost planning. As a result, long length LT lines carry huge loads resulting in very high energy losses and are easy targets for power theft and illegal connections. In addition, huge subsidies result in very low cost recovery. Uncontrolled use of over-sized water pumps to maximize water pumping has not only resulted in inefficient use of water but also over use of electricity. All of this is further compounded by the absence of any effective programs to influence consumer behavior and develop commercial discipline. Therefore, any distribution reform interventions at the rural level should target initiatives aimed at altering consumer behavior, introducing energy efficiency approaches, and injecting a commercial behavior within the distribution utilities, cooperatives, village electric committees, as well as consumer groups.

13. Some of the pilot projects and studies indicate that measures such as the extension of the 11 kW feeder network, installation of "one half" transformers at load centers, and the introduction of insulated overhead mains can result in substantial benefits in even a relatively subsidized environment. The LT less distribution has been used by Noida to provide connections to 300 of some 1150 agricultural pumps by extending the 11 kW HT lines and removing the LT lines entirely. This investment has proved to be very cost effective and worth replication. In addition, Noida has introduced metering in households in ten villages. This resulted in an increase in the collection efficiency to over 70 percent. Noida plans to implement several additional pilot projects aimed at rural and agricultural consumers. These success stories offer the SEBs and the Discoms opportunities to consider creative projects for rural distribution circles and feeders. The overall investment by Noida was approximately US $5 million. This project could be a good venue for USAID assisted training in distribution reform.

14. Another successful example of distribution reform in the rural sector is the distribution reform project through village level participation, planed and implemented by the Xavier Management Institute and BSES, Ltd, in 4,900 villages in Orissa, with a plan to expand the project to 19,000 villages.

Exhibit IV-1 provides a listing of additional interventions that any new USAID DR activity may need to facilitate in order to ensure that the best and most promising pilot distribution projects are selected. These interventions should be selected in partnership with and commitment from the State level entities, especially the SEBs and Discoms.

EXHIBIT IV-1

ILLUSTRATIVE ACTIVITIES/INTERVENTIONS
COMPONENT 2: STATE DISTRIBUTION REFORM PLANNING

CATEGORY OF INTERVENTION	ILLUSTRATIVE ACTIVITIES	PARTICIPATING ENTITIES	EXPECTED RESULT
1. Coordination of the DR project intervention with the state energy ministries, ministries of rural development, and state energy regulatory commissions	• Periodically, coordinate the interventions with the state ministries of energy and rural development, and state regulatory commissions (SERCs) • Provide technical assistance and training to the ministries on the development of reform plans and the monitoring and reporting of the reform results required under the MoAs (APDRP scheme) • Introduction of best practices for utility regulation, tariff, and licensing processes to SERCs	State level ministries of energy and rural development, energy departments, SEBs, Discoms, and state energy regulatory commissions, and other state organizations involved in the power sector	• Enhanced institutional capacity • Introduction of accounting and management practices and fiscal discipline • Best practices for commercial operations of SEBs and Discoms • Improvement in the reform contents of the memoranda of associations (MoAs) • Technical assistance and training in monitoring and reporting the progress on reforms • Enhanced institutional capacity of SERCs in rationalizing tariff and licensing processes related to distribution reform

2. Technical Assistance and Management Support to SEBs and Discoms	• Coordination, communication, and management buy-in on the process of selection of projects at the distribution circles and feeder levels • TA, training, roundtables, and workshops on the approaches to introducing commercial operations at the urban and rural levels, including projects at the distribution circle and feeder levels • TA and training, as needed, in the introduction of modern accounting and management principles for transition to commercial operations • TA and training for introducing modern technologies and systems for improvements in operational efficiency-trouble call management, load management, preventive maintenance, electronic metering, GAS mapping and feeder management, system planning, project management, EPS, and general modernization • TA and training in developing and implementing statewide standards • TA and training in designing effective customer relation management (CRM) programs • TA and training in developing effective consumer education and outreached programs	SEBs, Discoms, and management of distribution circles and the more reformed states	• Enhanced institutional capacity • More effective methods to design reform conditionalities and enhanced performance by states • Improved financial management of the SEBs and the Discoms • Improved technical skills to implement modern technology resulting in overall improvement in system efficiency • Better utility-consumer relationship and enhanced consumer confidence • Better quality and more reliable electricity availability to both urban and rural consumers • Gains in energy efficiency as well as water use efficiency through extensive consumer education and social outreach

	• TA and training in improving stakeholder engagement with industrial associations, consumer groups, farmers' unions and other private entities • Assistance to the SEBs and Discoms in the development of training programs for NGOs and other rural energy delivery entities • TA in assessing social policies and subsidies, especially in the rural sector for rural distribution projects		• Development of a more business-like climate, resulting in a more favorable climate for private participation in the distribution sector • Enhanced environmental benefit through more efficient use of electricity
3. Technical Assistance and Capacity Building to distribution utilities and distribution circles	• TA and training to management of distribution circles and feeders selected as pilot projects in the design of the projects • Training to managers of distribution circles in commercial operations of distribution circles as profit centers • Training to managers and technicians in the distribution sectors and feeders on a variety of technical functions such as project engineering, EPC, project supervision, costing and accounting, and procurement • TA and designing systems for project cost and a schedule control, monitoring project results, documenting and reporting results, and developing plans for replication of projects in other circles and feeders	Managers and technicians of distribution circles and feeders Rural electric cooperators, NGOs, and other rural energy delivery entities	• Improved commercial performance at the distribution circle and feeder levels • Improved technical and management capacity • More uniform standards resulting in improved prospects for replication • Improved utility/consumer relationships and greater consumer confidence • Improved business climate leading to increased private sector participation • Better ability to separate and target subsidy and

	• TA and training and designing and implementing modern revenue collections approaches • Assistance and the design of manuals for contractor training, engineering standard, incentive-based tariffs, safety and service standards, market organization and vendor/industry relations, etc. • TA and the design of customer data basis and customer profiles • Assistance and monitoring and verification and technical and management audits • Assistance in developing parameters for commercial operations of the distribution circles and feeders		improve customer service as a result of a modern consumer data base • Improved ability to develop, design, and implement additional distribution reform projects • More effective social outreach and stakeholder participation resulting in educated costumer and, thus improved collections • Better ability to pinpoint the reform areas with best payback prospects and, hence greater facility for targeting and prioritizing new investments
4. Design of stakeholder participation mechanisms (consumer groups, industry associations, rural cooperatives, village electric committees, NGOs, etc.	• Assistance and replication of best practices in rural energy delivery (the Noida approach, the XMI approach) by direct involvement of village level institutions and consumer groups • Assistance and designing communications and consumer education programs in improving the overall	Distribution circle and feeders, village electric committees, consumer groups, rural development entities, NGOs, and other intermediaries	• Improved targeting and understanding of subsidy requirements • Improved customer service and consumer confidence • A more targeted social outreach resulting in the

	electricity use efficiency and collections • Assistance and designing successful models for improving the quality of electricity delivery (the Bangladesh REB/PBS model) and other successful rural cooperative approaches • Assistance in evaluating outsourcing and franchise approaches to improving rural energy distribution, reducing losses, and increasing collections • Assistance in designing rural projects, which have unique characteristics such as low density, long distances, higher risks, lack of consumer education and complex load mix • Assistance in designing more customer friendly meter reading, billing, collection, and complaint management approaches to integrate the rural consumer into the mainstream of the electric power business • Assistance in designing conditions that would make it attractive for private contractors to take on distribution management at the distribution circle and feeder levels	between the utility and the rural consumer	reduction of both technical and non-technical losses • Greater efficiency and transparency through the use of outside contractors and NGOs • More self sustained systems through implementing successful rural electrification models such as consumer cooperatives, producer cooperatives, franchises, and NGOs • Better prospects for mobilizing consumer "sweat equity" through direct consumer participation in electricity distribution • Greater village level economic activity and income distribution • Enhanced development of the rural sector through new rural industries

ANNEX V: ILLUSTRATIVE APPROACHES AND RATIONALE FOR COMPONENT 3: DISTRIBUTION CIRCLE PILOT PROJECT REPLICATION AND OUTREACH

Component 3 General Rationale and Approach

As discussed in Chapter 2 of Volume I: Main Report, electricity distribution throughout India is currently plagued by deteriorating and strained physical infrastructure, weak management practices, and non-cost reflective rural retail electricity tariff structures. This potent combination of deficiencies has resulted in a vicious circle of inadequate revenue collection, increasing deterioration of physical distribution assets, poor electricity supply quality, extreme electricity losses (both technical and commercial losses), poor collection of billed electricity, and consumer dissatisfaction with the State electricity distribution entities. The situation is particularly acute for rural electricity distribution where past government policies have resulted in current tariffs (widely based on flat rate tariffs and no metering) that are mostly well below the cost of electricity supply. The Recommendations of the Team for the selection of pilot distribution reform projects come from a detailed analysis of the root causes of the problems currently plaguing electricity distribution in India and solutions - technical, managerial, and consumer driven solutions - to these causes currently being developed and implemented in South Asia. The Interventions selection and design process has also drawn on the experience of other developing nations with operational and financial turnaround of electricity distribution entities.

Key Electricity Distribution Operation and Management Issues

Key electricity distribution managerial, operational, and technical issues that should be considered in design of the pilot projects at the distribution circle or feeder level are described below:

- The importance of sustained and sound customer relations management (CRM) and the integral involvement of existing and future consumers, particularly rural consumers, in the design of self-sustained commercialization interventions

- The importance of improving both the level (reduced and more controlled and orderly electricity rationing or continuous electricity supply) and quality of electricity supply as critical components in building consumer confidence and support for electricity distribution reform and, potentially, reducing electricity consumption

- The importance of an integrated approach to addressing electricity losses and end-use efficiency at "both sides of the meter", particularly in the context of improving the efficient use of electricity for agricultural irrigation (India is estimated to have at least 50 million irrigation pump sets)

- Breaking of the current apathetic approach to electricity distribution management by reengineering distribution managerial and operational functions and empowering managers at all operational levels, including, if necessary, revision of labor union practices

- Provision of adequate initial training and continuing training support to all distribution management and operating staff as part of the interventions under any new USAID intervention

- Development of adequate interim financing mechanisms for distribution systems rehabilitation, modernization, and expansion to allow for successful pilot project demonstration interventions and to bridge the time period until distribution entities are able to access financing from conventional, commercial sources

- Development of sound, viable, and transparent quasi-government financial institutions for long-term financing of electricity supply for high-poverty, rural regions

- The importance of application of viable technical solutions that have been demonstrated under prevailing Indian conditions for elimination of electricity theft, reduction of technical electricity losses, and electrification extension to currently un-served rural consumers. This includes the importance of metering both the electricity distribution network and customers

- The need to demonstrate DR interventions that can generate revenue adequate for self-sustained operation or that minimize and provide for phase out of required subsidies

- The importance of using specialist, India-experienced contractors with direct electricity distribution expertise to plan, implement, and monitor and refine the pilot projects and the importance of involving knowledgeable, committed Indian financial institutions in interventions design and financing

- Targeting of the pilot projects in distribution networks that will be of maximum benefit to electricity distribution reform at the national level

The last consideration indicates that any new pilot distribution projects should be located only in power sector reform States. The Discoms established or to be established in these States are judged to provide the best platforms for Interventions implementation. This conclusion is based on a sampling of Discoms conducted during the field visit. Senior managers in the new Discoms are generally supportive of electricity distribution reform, have reorganized Discoms management to better reflect their electricity distribution mission, and, in many cases, have started implementing reforms including experimentation with innovative technical solutions to reducing losses, improving billings and collection, and improving customer relations management. All of the reform States also have in place functioning autonomous State Electricity Regulatory Commissions.

Financing Issues

The most intractable and complex problem facing electricity distribution reform and restructuring in India is the long-term financial viability of rural electricity supply. Currently, in India, almost 40 percent of the consumers of electricity are situated in rural regions. This contrasts with a rural population that accounts for 74 percent of the total population. However, it is estimated that rural consumers account for only 20 percent of actual electricity consumption. Underlying the India rural electricity supply financial viability problem are four primary factors:

1. First, the system has an inherent low electricity load density (low electricity consumption and revenue generation per length of electricity supply network or asset base) and a consumption pattern highly skewed to small residential and agricultural consumers. In general, but particularly in India, this limits the basic revenue generating potential of rural electricity distribution to low levels compared with urban and near-urban regions. Low rural load density is a direct consequence of the rural economy being dominated by agriculture and is a phenomenon found in both developing and developed nations with significant agriculture production. The issue of the comparatively low revenue generation potential of rural electricity distribution is compounded by the fact that this load, being at low supply voltages and in remote regions, invariably has the highest cost of electricity supply.

2. Second, because of past rural electricity supply policies, there is a critical need to rehabilitate and modernize much of the existing rural electricity supply network and build, from an extremely low level of satisfaction, consumer understanding of the economic requirements of sustainable electricity supply. This is a much more complex task than initial electrification of rural regions. Approximately, 25 years ago India initiated policies to rapidly electrify its rural regions because of a critical necessity to increase agricultural productivity and better serve the basic needs of the rural population. While the push to rural electrification was successful, India has been unable to marshal the resources required to maintain it over the long-term. As a result, much of the

rural electricity supply network has significantly deteriorated and appears to require major rehabilitation to adequately serve just existing consumers let alone extend the distribution grid to supply new rural consumers. A major contributing factor to this aspect of the rural electricity supply problem has been a national policy of providing electricity to agriculture consumers at highly concessional tariffs.

3. Third, is the current perception that all electricity distribution can be "best" provided by private sector companies. In India, this is typified by the World Bank-led and financially supported electric power sector reform and restructuring in Orissa. This is the first implementation of electricity distribution privatization in India as a result of the unbundling of an SEB. In this restructuring, Orissa's distribution network was divided into four distribution companies as a prelude to privatization. The new distribution companies included both village level and urban consumers. Upon privatization, it rapidly became clear that the rural consumers represented a major drag on revenue generation for the new owners of distribution and contributed to the only international utility investor-owner abandoning their distribution company. The other distribution company owner, BSES recognized that a potential solution to the rural distribution revenue problem was to apply different management and operating modalities to urban and rural consumers. This, as well as other experiences in South Asia, clearly put the consideration of other approaches to addressing rural electricity supply on the electricity distribution reform and restructuring agenda. A potential significant aspect of the Orissa experience is that it occurred against a background of only limited existence of rural electricity load compared with larger states.

The perception that rural electricity distribution can be "best" provided by private sector companies is in stark contrast to private sector utilities primary need to grow earnings to be successful in current markets. With deregulation and the changes it has brought to the utility industry, if a utility cannot adequately grow earnings it risks inadequate market valuation and takeover by a more aggressively managed utility. This is clearly seen in the US in which some deregulated utilities are looking at ways of reducing their exposure to rural consumers because of low revenue generation. While the issue of utility earnings is not yet a direct issue in India, it likely will be important if there is actual privatization of electricity distribution in which it is intended that international utility investor-owners are major participants.

4. Fourth, there is an overall perception in some circles that despite the prevailing levels of poverty in India's rural areas most rural consumers can afford to pay the real cost of the electricity. This emanates from the belief that electricity subsidies are economically bad and must be removed. This raises the critical issue of how much rural consumers can really afford to pay for an adequate, quality electricity supply given their incomes. An additional aspect

of the rural electricity distribution problem is that its dimensions and seriousness have generally been ignored by the specialists involved in the design of electric power sector reform and restructuring. However, there is increasing recognition of the fundamental operational and revenue generating differences between urban and industrial electricity distribution and rural distribution.

Key Considerations for Pilot Projects

If the rural electricity supply reform issue is not properly addressed, it has the potential to stall or at least significantly slow overall electric power sector reform and restructuring. Further, failure to adequately address the rural electricity supply problem in a timely manner at the national level could have serious economic and political consequences.

Based on the field visit, the Team believes that the following should be the key criteria that should go into the selection and design of any pilot projects:

- Improving the probability of successful pilot projects by provision of specific means for early detection of developing problems and an ability to rapidly devise solutions that can be immediately tested

- Providing Intervention designers with information for validating and refining the technical and business solutions that have been developed to address the complexities of electricity distribution reform

- Full documentation of pilot project results in order to design replication projects in other parts of the country

- Use of the pilot projects as platforms to innovation

- Early detection of potential new business opportunities that will likely emerge as the result of an Intervention and allow such opportunities to be incorporated into the Interventions, as appropriate.

Regulatory Issues for urban and Rural Electricity Distribution

Another area that has a direct bearing on the potential success of any new intervention by USAID is the current status of the regulatory regime. The Electricity Regulatory Commissions established in the Reform States are relatively new. To date, their main activities have related to tariff setting and the issuance of operating licenses. Review of the Electricity Acts for the Reform States indicates that the same regulations and performance and safety standards apply to all electricity supply licensees. The license conditions for a Discom serving a major metropolitan region with diverse consumer groups are the same as those that apply to a rural electricity supply co-operative society serving under

50,000 customers who are almost exclusively rural residential and agriculture consumers. Given the significant differences between urban and rural electricity distribution requirements and load densities, and the growing consideration to applying different management modalities to urban and rural distribution, this may not represent the best approach for addressing the basic rural electricity distribution problem from a regulatory standpoint. There is precedence for considering separate regulation of rural distribution. In Bangladesh, the rural electricity distribution is regulated separately from the main parastatal urban electricity distribution entities. In the US, rural electric cooperatives are regulated differently than investor owned utilities. It should be noted that while the Reform State Electricity Acts do not specifically provide for separate types of licenses for different types of electricity distributors they do not prohibit it.

Therefore, a component of any new USAID activity should be devoted to exploring with Electricity Regulator Commissions the potential benefits of crafting different types of licenses and regulations for fundamentally different types of electricity distribution entities based on experience from the pilot projects. The main beneficiary of such regulation would be rural electricity distribution entities because of potential start-up and operating cost savings. The most stringent license provisions for obvious reasons will always be applied to large distribution entities serving urban loads. However, urban Discoms may be benefited if the urban pilot distribution projects can be used to promote with the Regulatory Commissions incentive based tariffs or the division of urban load in order to differentiate reliability of supply categories. Potential areas for regulatory improvements that might result from the pilot projects under a new USAID activity include the following:

- Improved targeting and design of subsidies
- Proposals for design and implementation of incentive based retail electricity tariffs
- Proposals to provide incentives for investment in rural electricity supply and in upgrading/modernizing urban electricity supply
- Quantification of the importance of transmission grid open access and banking to electricity distribution entities
- Proposals for design and implementation of tariffs that differentiate between reliability of electricity supply
- Proposal for regulatory provision for load management
- Proposal to reduce construction and performance standards for rural electricity distribution to reduce costs

- Development of simpler, less costly financial reporting requirements for rural electricity distribution entities

- Regulatory provisions for promoting DSM

- Resolution of regulatory conflicts between multiple regulatory bodies having jurisdiction over electricity distribution, particularly rural distribution and streamlining of regulation

Pilot Project Implementation and Replication Issues

A frequent difficulty with successful demonstration projects funded by donors is their inability to be replicated without similar grant or concessional funding. Therefore, pilot projects need to be selected and designed to reduce this risk. Indeed the success of any new DR project intervention is predicated on the requirement for the development of financing and implementation of electricity distribution reform interventions that are suitable for wide-scale replication in India. A key factor in promoting replication will be the direct participation of the pilot project implementers in project design and their willingness to support replication should be one of the main criterion for selection.

Basic pilot project replication products are identified in Exhibit III-1. These could include the following approaches:

- Media presentations

- Interacting with Component 1 and 2 Project participants

- Pilot interventions site visits and internships

- Replication training

- Promotional workshops

- Consideration of creation of Apex Organizations for provision of managerial, technical, and legal support to replication implementers

Each of the selected pilot projects should be implemented by a group of specialist contractors and financing entities selected as partners by USAID. The specialist contractors will be tailored to the specific requirements of each type of Intervention with different Interventions likely employing different sets of specialist contractors. However, each pilot project should use the following general design and implementation approach:

- Selection of pilot projects intervention design, implementation, and replication specialist contractors

- Development of a communications program to build support and obtain potential implementing entities inputs for the selected projects. The Program would also communicate Intervention accomplishments and support replication

- Selection of intervention implementing entities, such as a Discom or co-operative society, and distribution network component(s) in one of the Reform States based on specific selection criteria and, to the extent practical, a competitive selection process

- Development of performance standards for the pilot projects. The standards should include specific economic and financial criteria to be applied during engineering, design, and implementation

- Development of engineering designs for the intervention electricity distribution network components for required rehabilitation, modernization, and expansion consistent with the performance standards. The engineering will address both reliable, high-quality electricity supply and consumer utilization, including implementation of demand side management (DSM) technology and practices

- Development of a Consumer Relations Management (CRM) Program to ensure that the pilot projects meet consumer needs and have their buy-in. The CRM Program will include DSM initiatives to promote sustained application of efficient electricity uses

- Development of a Distribution Management and Operations Program and Business Plan to establish commercial practices to be implemented during an Intervention and provide for their continuance following the formal Intervention period

- Preparation of training programs for electricity distribution management and operations staff and the consumers

- Development of a pilot project cost estimate, financial performance projections, financing plan, an implementation plan, and performance monitoring program covering all aspects of the intervention

- Implementation of construction-installation quality assurance and quality control program for the selected pilot projects

- Implementation of training programs to ensure commercial distribution operations and prepare consumers for such operation, including consumer participation in actual operations. For consumers, the training will include DSM awareness and applications training

- Implementation and performance monitoring of pilot projects. This should include a proactive Performance Monitoring, Analysis, and Reporting Program to identify management, operating, and technical issues, including issues at the consumer level, as they arise during the pilot project implementation phase

- Based on Commercialization Intervention results and analysis, design of distribution reform incentives to be implemented by State Electricity Regulatory Commissions and interaction with these Commissions to incorporate validated incentives into the regulatory process

- Development and implementation of a Distribution Reform Replication Plan for widespread replication of the demonstrated pilot projects

The Team suggests the use of competitive selection methods to select potential implementers for each of the selected pilot projects. The details of the procedure for selection of the commercialization implementers will need to be developed by the partnering Discom or the SEB. Key reasons for proposing some form of competitive selection are:

- Its potential for providing a measure of the seriousness which the different types of implementers place on electricity distribution reform and restructuring and their understanding of its requirements. The implementers' selection process should be specifically designed to illicit such information

- The desire to attract as much cost sharing and fund leveraging as practical

- To obtain as strong a management commitment on the part of the implementers as practical

The Team realizes that the implementers' selection competitiveness may be limited because of the limited number of Discoms established in the Reform States and the desirability of spreading the pilot projects among the Reform States. The number of electricity supply co-operative societies and private sector companies interested in owning rural electricity distribution operation is also quite limited, even in the Reform States. The competitiveness that can be achieved in the selection process will also likely be limited by the potential commercialization implementers' experience in proposal preparation and the time and effort they are prepared to allocate to such an activity.

For all pilot projects under a new USAID DR activity, the selected network components will be part of an electricity distribution circle. In India, electricity distribution has been designed around the distribution circle concept. In this design approach, an attempt has been made to provide for the reliability of supply by being able to feed all distribution substations from at least two separate high-voltage supplies. In many instances, an electricity distribution circle spatially coincides with a State civil administration District. The electricity distribution circle is also the level at which APDRP is directing its distribution intervention.

ANNEX VI: FINANCIAL ANALYSIS OF URBAN VERSUS RURAL DISTRIBUTION REFORM PROJECTS

In order to further understand the complex differences between urban and rural electricity distribution reform, the Team carried out a detailed analysis of a large number of urban and rural projects typical within India's power sector. The team selected a variety of consumer profiles within both the urban and the rural sectors to account for the wide variation in consumer patterns throughout India. Four separate cases were considered for both the urban and rural projects and detailed cash flow, ROI, and payback analyses were conduced based on financial assumptions consistent with the current financial markets in India. This discussion summarizes the results of this analysis and confirms that very different approaches will be needed for introducing distribution reform in the urban and rural sectors.

1. Urban Areas Electricity Distribution System Improvement Interventions

An urban area having an area of 50-100 sq. km. and a population of around 200,000 persons has been considered. This could be a small town, or a part of a town or a city, and could correspond to one sub-division within a distribution circle. The distribution system in such an area would typically comprise of 2 33/11 kV sub-stations each having 6 feeders of 11 kV level, about 133 km of 11 kV lines, about 200 km of LT lines, and about 400 distribution transformers. Other typical characteristics are shown in Exhibit VI-1.

Consumers in urban areas have been taken as a mix of domestic, commercial and LT industrial consumers. A total of 12 consumer profile cases have been defined corresponding to different consumer density, consumer mix, load density and load factor as shown in Exhibit VI-2. These cases correspond to ranges of 32,500-62,000 consumers, 36.5-125.0 MW connected load, and 62-326 million units/year energy input for the typical urban area being considered.

The distribution system improvements in urban areas would include some or all of the following elements, and in varying degrees depending on site-specific factors: modifications to and augmentation of the sub-transmission system (33/11 kV sub-stations, 33 kV lines), conversion of LT lines to HT lines, reconductoring of HT and LT lines, replacement of bare conductor LT lines by insulated conductor lines, replacement of large 3 phase distribution transformers by smaller energy efficient 3 phase or single phase transformers, single phase distribution in congested areas, and meters at customer premises. These would result in reduced technical losses and also enable commercial losses to be controlled. The range of costs for such improvements has been taken as 2,000-3,000 Rs/kW connected load. For the cases considered, this corresponds to a range of Rs. 7.3-38.0 crores for the cost of the intervention.

Exhibit VI-1: Urban Area Distribution System Improvement Analysis: Typical Characteristics

Area	sq. km.	50-100	
Population density	persons/sq. km.	2,000-4,000	
Population	persons	200,000	
Distribution System:			
33/11 kV sub-station	nos.	2	
11 kV feeders	nos.	12	
11 kV lines	km	133	
LT lines	km	200	
Distribution transformers	nos.	400	
Technical Loss	%	25	
Commercial Loss:		High Case	Low Case
Domestic	%	10	5
Commercial	%	5	2
LT Industrial	%	5	2
Average Tariff:			
Domestic	Rs/kWh	2.00	
Commercial	Rs/kWh	5.00	
LT Industrial	Rs/kWh	4.00	
Cost of Purchase	Rs/kWh	2.50	
Distribution System Improvement:			
		High Case	Low Case
Cost	Rs/kW connected load	3,000	2,000
		High Case	Low Case
Technical Loss Reduction	%	60	50
Commercial Loss Reduction:			High Case
	Low Case		
Domestic	%	75	50
Commercial	%	75	50
LT Industrial	%	75	50

Exhibit VI-2: Urban Area Distribution System Improvement Analysis: Consumer Profile Cases

Case		1	2	3	4	5	6
No. of Consumers:							
Domestic	nos.	30,000	30,000	40,000	40,000	50,000	50,000
Commercial	nos.	2,000	2,000	4,000	4,000	8,000	8,000
LT Industrial	nos.	500	500	1,000	1,000	4,000	4,000
Total	nos.	32,500	32,500	45,000	45,000	62,000	62,000
Connected Load	MW	36.5	53.8	53.0	77.5	86.0	125.0
	kW/consumer	1.12	1.65	1.18	1.72	1.39	2.02
Energy Input	MU/yr	62.1	91.7	89.2	130.8	140.2	204.4

Case		7	8	9	10	11	12
No. of Consumers:							
Domestic	nos.	30,000	30,000	40,000	40,000	50,000	50,000
Commercial	nos.	2,000	2,000	4,000	4,000	8,000	8,000
LT Industrial	nos.	500	500	1,000	1,000	4,000	4,000
Total	nos.	32,500	32,500	45,000	45,000	62,000	62,000
Connected Load	MW	36.5	53.8	53.0	77.5	86.0	125.0
	kW/consumer	1.12	1.65	1.18	1.72	1.39	2.02
Energy Input	MU/yr	102.3	151.0	146.2	214.4	224.1	326.2

For each of the consumer profile cases, two cases of improvement in technical and operational performance have been considered. In the high improvement case, technical losses are assumed to be reduced by 60 %, and commercial losses (taken as 5-10 % for different consumer categories) by 75 %. In the low improvement case, technical losses are assumed to be reduced by 50 %, and commercial losses (taken as 2-5 % for different consumer categories) by 50 %.

In the high improvement cases, as shown in Exhibit VI-3, the existing situation corresponds to ranges of 42-224 million units/year for billed consumption and Rs. 10.2-63.6 crores/year for revenue. Implementation of distribution system improvements would result in energy savings of 9-49 million units/year and net savings of Rs. 2.7-15.4 crores/year. These savings arise due to increases in billed consumption (due to reductions in commercial losses) in the range of Rs. 0.7-3.8 crores/year, and decreases in input energy purchase cost (due to reduction in technical losses) in the range of Rs. 2.3-12.2 crores/year. The investment per energy input varies between 0.7-1.8 Rs/ kWh/year input, investment per energy savings varies between 4.8-12.3 Rs/ kWh/year saved, and the simple payback period varies between 1.5-4.2 years.

In the low improvement cases, also shown in Exhibit VI-3, the existing situation corresponds to ranges of 45-235 million units/year for billed consumption and Rs. 10.7-66.4 crores/year for revenue. Implementation of distribution system improvements would result in energy savings of 8-41 million units/year and net savings of Rs. 1.9-10.7 crores/year. These savings arise due to increases in billed consumption (due to reductions in commercial losses) in the range of Rs. 0.2-1.2 crores/year, and decreases in input energy purchase cost (due to reductions in technical losses) in the range of Rs. 1.9-10.2 crores/year. The investment per energy input varies between 0.7-1.8 Rs/ kWh/year input, investment per energy savings varies between 5.7-14.7 Rs/ kWh/year saved, and the simple payback period varies between 2.2-6.2 years.

The variation and the range of payback period corresponding to the investment per energy input expressed in terms of Rs. per kWh/year of energy input at present into the distribution system is shown in Exhibit VI-4, and corresponding to the investment per energy savings (expressed in terms of Rs. per kWh/year of energy savings arising from the distribution system improvements) is shown in Exhibit VI-5. For all three parameters, the highest values are around 2.5/3-4 times the lowest values, which indicates that the overall range of variation for urban area projects is not very wide. Further, for most of the cases considered, the payback period is less than 4 years, which indicates that these projects are generally financially attractive.

Exhibit VI-3: Urban Area Distribution System Improvement Analysis: Results

Improvement		High Improvement		Low	
		Low	High	Low	High
Existing (pre-project):					
Energy Input	MU/yr	62.1	326.2	62.1	326.2
Billed Consumption	MU/yr	42.3	224.2	44.5	234.8
	kWh/month/ customer	120	331	120	330
Revenue	Rs. lakhs/year	1024	6365	1074	6637
Average Realization	Rs/kWh billed	2.36	2.95	2.35	2.94
Distribution System Improvement Cost:					
Low Case	Rs. lakhs	730	2500	730	2500
High Case	Rs. lakhs	1095	3750	1095	3750
Future (post-project):					
Energy Input	MU/yr	52.8	277.3	54.3	285.4
Energy Input Savings	MU/yr	9.3	48.9	7.8	40.8
	kWh/yr saved/ kW connected load	244.5	421.4	203.8	351.2
Revenue	Rs. lakhs/year	1096	6746	1097	6755
Average Realization	Rs/kWh billed	2.35	2.93	2.35	2.93
Revenue Savings:					
Increase in Billing	Rs. lakhs/yr	72	381	23	118
Decrease in Energy Input Purchase Cost	Rs. lakhs/yr	233	1223	194	1019
Net Savings	Rs. lakhs/yr	274	1535	187	1069
Investment / Energy Input (pre-)	Rs/ kWh/yr input	0.71	1.84	0.71	1.84
Investment / Energy Savings	Rs/ kWh/yr saved	4.75	12.27	5.70	14.72
Payback period	years	1.5	4.2	2.2	6.2

Exhibit VI-4: Urban area projects: Variation and Range of Payback period vs. Investment per Energy Input

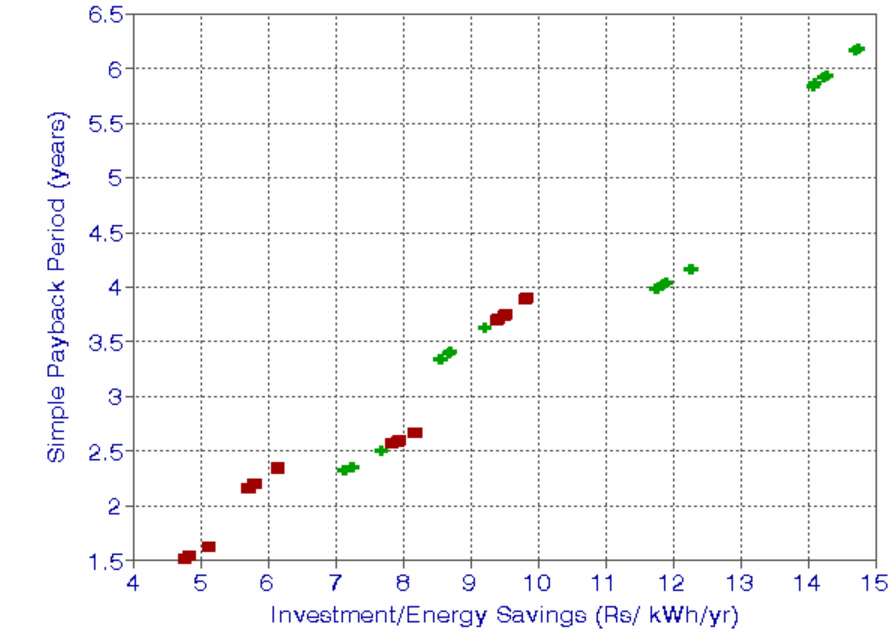


Exhibit VI-5: Urban area projects: Variation and Range of Payback period vs. Investment per Energy Savings

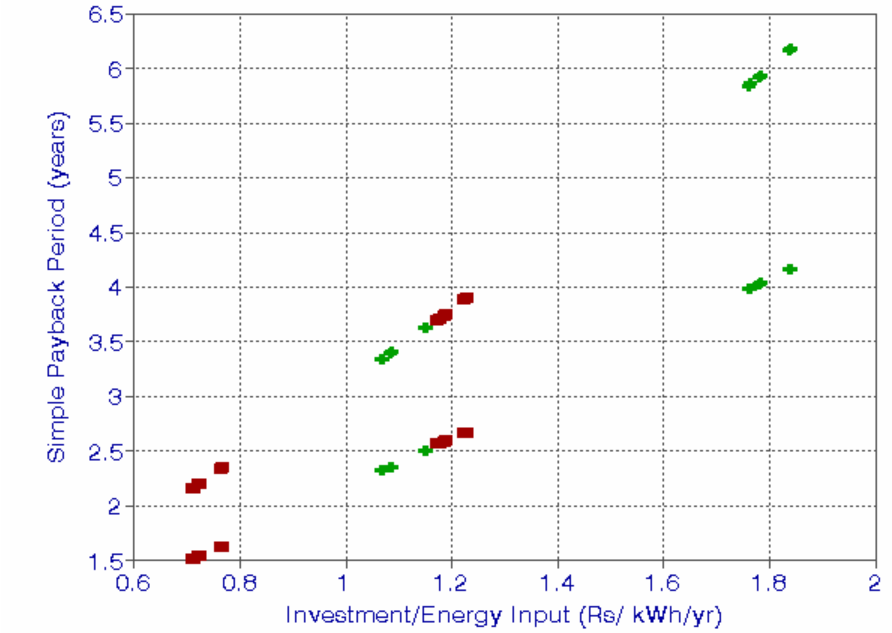


Exhibit VI-6 shows the variation and the range of payback period corresponding to the energy savings per connected load expressed in terms of kWh/year of energy savings per kW of connected load. The higher the load factor of the distribution system, the higher the energy savings and the lower the payback period. For savings greater than 250 kWh/year saved / kW connected load, the payback period is less than 4 years even when the investment is on the higher side.

The parameters and their ranges used for financial analysis are given in Exhibit VI-7. The construction period for urban area projects has been considered to be one year with partial savings beginning to accrue as partial implementation takes place and full savings being realized from the second year onwards. Accordingly, the moratorium for loan repayment has also been considered to be one year. The debt-equity ratio has been taken as 3, and interest rate on term loan, between 8-14% with the repayment period between 6-12 years.

Within the range of urban area projects, four cases have been selected and detailed financial analysis of these has been carried out. The details of these cases are shown in Exhibit VI-8. For these four cases, the payback periods are 1.5, 2.6, 3.9 and 6.2 years, and the project FIRRs are 98.4, 47.4, 28.1 and 14.5 %.

The variation of debt service coverage ratio (DSCR) corresponding to different interest rates and loan repayment periods is shown in Exhibit VI-8 for three of these cases. For the cases having payback periods of 1.5 and 2.6 years, the DSCR is higher than 1.5 even for financing at 14% interest for 6 years. The analysis shows in Exhibit VI-9, that projects having payback period less than 3 years can comfortably service a term loan at 14% interest over 6 years. However, for projects having a payback period of 4 years, repayment will be required over 8-10 years for a term loan at 14% interest, and for projects having payback periods of 5 years, repayment will be required over 12 years. For projects having a payback period of 6 years, a term loan at 14% interest even with repayment over 12 years will not be serviceable. As shown in Exhibit VI-9, for the DSCR to be comfortable for such projects, financing at 8% interest with repayment over 12 years will be required.

As mentioned above, for urban area projects, the payback period is less than 4 years for most of the cases considered. Hence, these projects can generally be financially viable with interest rates of 12-14% and repayment periods of 6-8 years.

Exhibit VI-6: Urban area projects: Variation and Range of Payback Period vs. Energy Savings per Connected Load

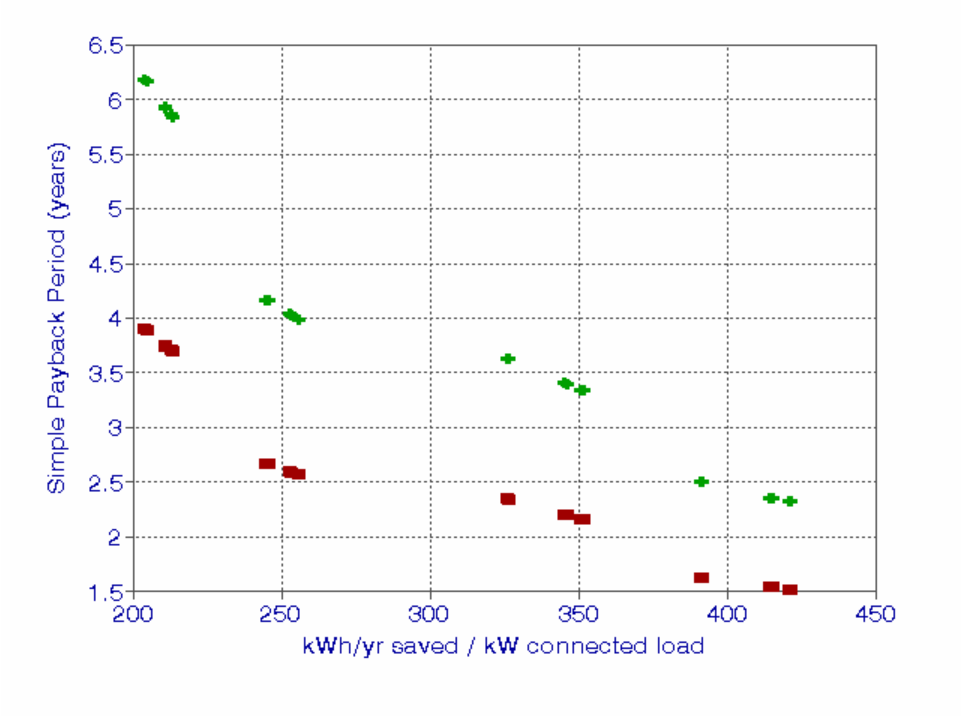


Exhibit VI-7: Urban Area Distribution System Improvement Analysis: Financial Analysis Parameters

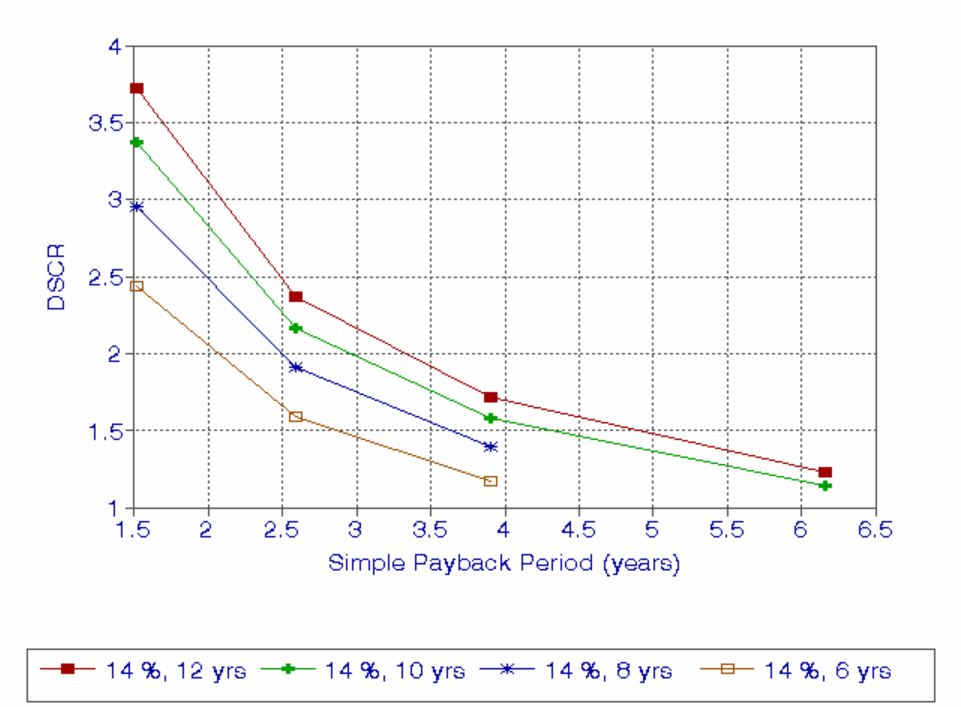
Debt-Equity Ratio	3.0
Equity	25.0 %
Debt	75.0 %
Term Loan Interest Rate	8.0, 10.0, 12.0, 14.0 %
Repayment Period (incl. Moratorium)	6, 8, 10, 12 years
Loan Repayment Moratorium	1 year
Loan Installments Payment	Quarterly
Working Capital Loan Interest Rate	12.0 %
Depreciation Rate (Accounting, SLM)	7.84 %
Depreciation Rate (Income Tax, WDV)	25.0 %
Income Tax Rate	35.0 %
Salvage Value	10.0 %
Construction Period	1 year
Capital Expenditure Schedule	
Year 1	100.0 %
Savings Level	
Year 1	50.0 %
Year 2	100.0 %
Treatment of Loss	Carried Forward

Exhibit VI-8: Urban Area Distribution System Improvement Analysis: Cases for Financial Analysis

Case		U-1	U-2	U-3	U-4
No. of Consumers:					
Domestic	nos.	30,000	40,000	50,000	50,000
Commercial	nos.	2,000	4,000	8,000	8,000
LT Industrial	nos.	500	1,000	4,000	4,000
Total	nos.	32,500	45,000	62,000	62,000
Unauthorized consumers:					
Domestic	%	10	10	5	5
Commercial	%	5	5	2	2
LT Industrial	%	5	5	2	2
Connected load	kW	36,500	53,000	86,000	125,000
	kW/consumer	1.12	1.18	1.39	2.02
Energy Input	MU/yr	102.320	89.184	140.208	204.360
Billed Consumption	MU/yr	69.618	60.916	101.082	147.248
Revenue	Rs. lakhs/yr	1672.80	1575.36	2969.96	4236.21
Average Realization	Rs/ kWh billed	2.40	2.59	2.94	2.88
Sample DR Project:					
Capital Expenditure	Rs/ kW connected load	2,000	2,000	2,000	3,000
	Rs. lakhs	730.00	1060.00	1720.00	3750.00
Reduction in Losses:					
Technical Loss	%	60	60	50	50
Commercial Loss, Domestic	%	75	75	50	50
Commercial Loss, Commercial	%	75	75	50	50
Commercial Loss, LT Industrial	%	75	75	50	50
Post-Sample DR Project:					
Energy Input	MU/yr	86.972	75.806	122.682	178.815
Billed Consumption	MU/yr	74.960	65.395	103.119	150.259

Energy Input Savings	MU/yr	15.348	13.378	17.526	25.545
	kWh/yr/ kW connected load	420.5	252.4	203.8	204.4
Revenue	Rs. lakhs/yr	1790.70	1679.04	3020.38	4309.61
Average Realization	Rs/ kWh billed	2.39	2.57	2.93	2.87
Revenue Savings:					
Increase in Billing	Rs. lakhs/yr	117.90	103.68	50.42	73.39
Decrease in Energy Input Purchase Cost	Rs. lakhs/yr	383.70	334.44	438.15	638.62
Net Savings	Rs. lakhs/yr	501.60	438.12	488.57	712.02
Incremental Costs	Rs. lakhs/yr	20.08	29.15	47.30	103.13
Increase in Working Capital	Rs. lakhs	81.65	61.27	47.41	76.78
Investment / Energy Input (pre-)	Rs/ kWh/yr input	0.71	1.19	1.23	1.83
Investment / Energy Savings	Rs/ kWh/yr saved	4.76	7.92	9.81	14.68
Simple Payback Period	years	1.52	2.59	3.90	6.16
Project FIRR	%	98.4	47.4	28.1	14.5

Exhibit VI-9: Figure U-5: Urban Area Projects: Variation of DSCR vs. Payback Period for Project Financing at 14 % Interest and Repayment Period from 6 to 12 years



2. Rural Areas Electricity Distribution System Improvement Intervention

A rural area having an area of 200-250 sq. km. and a population of around 50,000 persons has been considered. This could comprise a number of villages, and could correspond to one section within a distribution circle. The distribution system in such an area has been taken to typically comprise of 1 33/11 kV sub-station having 6 feeders of 11 kV level, about 150 km of 11 kV lines, about 450 km of LT lines, and about 150 distribution transformers. Other typical characteristics are shown in Exhibit VI-10.

Consumers in rural areas have been taken as a mix of domestic and agricultural consumers. A total of 7 consumer profile cases were defined corresponding to different consumer density, consumer mix, load density and load factor as shown in Exhibit VI-11. These cases correspond to ranges of 7,500-11,000 consumers, 9.7-18.0 MW connected load, and 18-65 million units/year energy input for the typical rural area being considered.

Exhibit VI-10: Rural Area Distribution System Improvement Analysis: Typical Characteristics

Area	sq. km.	200-250	
Population density	persons/sq. km.	200-250	
Population	persons	50,000	
Distribution System:			
33/11 kV sub-station	nos.	1	
11 kV feeders	nos.	6	
11 kV lines	km	150	
LT lines	km	450	
Distribution transformers	nos.	150	
Technical Loss	%	30	
Commercial Loss:			
Domestic	%	20	
Agricultural	%	10	
Average Tariff:			
Domestic	Rs/kWh	1.50	
Agricultural (flat)	Rs/hp/month	60	
Agricultural (metered)	Rs/kWh	0.50	
Cost of Purchase	Rs/kWh	2.50	
Distribution System Improvement:			
		High Case	Low Case
Cost	Rs/kW connected load	20,000	10,000
		High Case	Low Case
Technical Loss Reduction	%	75	60
Commercial Loss Reduction:		High Case	Low Case
Domestic	%	100	75
Agricultural	%	100	75
		High Case	Low Case
Agricultural DSM Savings	%	40	30

Exhibit VI-11: Rural Area Distribution System Improvement Analysis: Consumer Profile Cases

Case		1	2	3	4	5	6	7	
No. of Consumers:									
Domestic		10,000	6,250	5,000	10,000	6,250	5,000	10,000	
Agricultural		1,000	2,000	2,500	1,000	2,000	2,500	2,500	
Total		11,000	8,250	7,500	11,000	8,250	7,500	12,500	
Connected Load	MW		9.7	11.2	12.3	13.6	16.2	18.0	22.0
kW/consumer			0.88	1.36	1.64	1.24	1.96	2.40	1.76
Energy Input	MU/yr		17.5	24.3	28.2	25.0	35.7	41.7	65.2

The distribution system improvements in rural areas would include some or all of the following elements, and in varying degrees depending on site-specific factors: modifications to and augmentation of the sub-transmission system (33/11 kV sub-stations, 33 kV lines), conversion of LT lines to HT lines, reconductoring of HT and LT lines, replacement of bare conductor LT lines by insulated conductor lines, replacement of large 3 phase distribution transformers by smaller energy efficient 3 phase transformers for agricultural loads, single phase supply for domestic consumers, and meters at customer premises. These would result in reduced technical losses and also enable commercial losses to be controlled. The range of costs for such improvements has been taken as 10,000-20,000 Rs/kW connected load. For the cases considered, this corresponds to a range of Rs. 9.7-44.0 crores for the cost of the intervention.

For each of the consumer profile cases, two cases of improvement in technical and operational performance have been considered. In the high improvement case, technical losses are assumed to be reduced by 75 %, and commercial losses (taken as 10-20 % for different consumer categories) by 100 %. Savings from agricultural DSM are assumed to be 40 %. In the low improvement case, technical losses are assumed to be reduced by 60 % and commercial losses by 75 %, and savings from DSM are taken as 30 %.

In the high improvement cases, as shown in Exhibit VI-12, the existing situation corresponds to ranges of 11-40 million units/year for billed consumption and Rs. 1.0-2.1 crores/year for revenue. Implementation of distribution system improvements would result in energy savings of 7-30 million units/year and net savings of Rs. 1.2-7.1 crores/year.

Exhibit VI 12: Rural Area Distribution System Improvement Analysis: Results

Improvement		High Improvement		Low	
		Low	High	Low	High
Existing (pre-project):					
Energy Input	MU/yr	17.5	65.2	17.5	65.2
Billed Consumption	MU/yr	10.5	40.3	10.5	40.3
	kWh/month/ customer	98	346	98	346
Revenue	Rs. lakhs/year	98	209	98	209
Average Realization	Rs/kWh billed	0.52	0.93	0.52	0.93
Distribution System Improvement Cost:					
Low Case	Rs. lakhs	973	2200	973	2200
High Case	Rs. lakhs	1946	4400	1946	4400
Future (post-project):					
Energy Input	MU/yr	10.9	35.2	12.4	42.2
Energy Input Savings	MU/yr	6.7	30.0	5.1	22.9
	kWh/yr saved/ kW connected load	685.6	1363.	4529.2	1042.8
Revenue	Rs. lakhs/year	92	224	95	235
Average Realization	Rs/kWh billed	0.69	1.07	0.67	1.03
Revenue Savings:					
Increase in Billing	Rs. lakhs/yr	-34	15	-26	26
Decrease in Energy Input Purchase Cost	Rs. lakhs/yr	167	750	129	574
Net Savings	Rs. lakhs/yr	118	705	78	539
Investment / Energy Input (pre-)	Rs/ kWh/yr input	3.38	11.09	3.38	11.09
Investment / Energy Savings	Rs/ kWh/yr saved	7.33	29.17	9.59	37.79
Payback period	years	3.1	16.5	4.1	24.8

These savings arise due to increases in billed consumption (due to reduction in commercial losses) in the range of Rs. (-) 0.3 to 0.2 crores/year, and decreases in input energy purchase cost (due to reductions in technical losses) in the range of Rs. 1.7-7.5 crores/year. The investment per energy input varies between 3.4-11.1 Rs/ kWh/year input, investment per energy savings varies between 7.3-29.2 Rs/ kWh/year saved, and the simple payback period varies between 3.1-16.5 years.

In the low improvement cases, as shown in Exhibit VII-12, the existing situation corresponds to ranges of 11-40 million units/year for billed consumption and Rs. 1.0-2.1 crores/year for revenue. Implementation of distribution system improvements would result in energy savings of 5-23 million units/year and net savings of Rs. 0.8-5.4 crores/year. These savings arise due to increases in billed consumption (due to reductions in commercial losses) in the range of Rs. (-) 0.3 to 0.3 crores/year, and decreases in input energy purchase cost (due to reductions in technical losses) in the range of Rs. 1.3-5.7 crores/year. The investment per energy input varies between 3.4-11.1 Rs/ kWh/year input, investment per energy savings varies between 9.6-37.8 Rs/ kWh/year saved, and the simple payback period varies between 4.1-24.8 years.

It should be noted here that, whereas in urban area projects, there would be an increase in billed consumption which forms a revenue stream, in rural area projects, billed consumption could both increase or decrease. The decrease in billed consumption is due to decreases in billed agricultural consumption, which arises due to reduction in energy consumption because of agricultural DSM, and could also be due to changing from flat tariff to metered tariff in cases where consumption is low. Decreases in billed consumption reduce the net benefit from the project.

Another effect of reduced agricultural consumption would be that the subsidy received by the utility from the state government would decrease, thereby further reducing the revenue savings from the project, and considerably increasing the payback period. In this analysis, it is assumed that over the duration of the loan repayment period, the subsidy is maintained at the original level.

The variation and the range of payback period corresponding to the investment per energy input expressed in terms of Rs. per kWh/year of energy input at present into the distribution system is shown in Exhibit VI-13. Similar analysis corresponding to the investment per energy savings expressed in terms of Rs. per kWh/year of energy savings arising from the distribution system improvements is shown in Exhibit VI-14. It is seen that the values of these parameters are much higher compared to those for urban area projects. While investment per energy input is in the range of 0.7-1.8 Rs/ kWh/year input for urban area projects, it is in the range of 3.4-11.1 Rs/ kWh/year input for rural area projects, i.e. roughly about 5 times more.

Exhibit VI-13: Rural Area Projects: Variation and Range of Payback Period vs. Investment per Energy Input

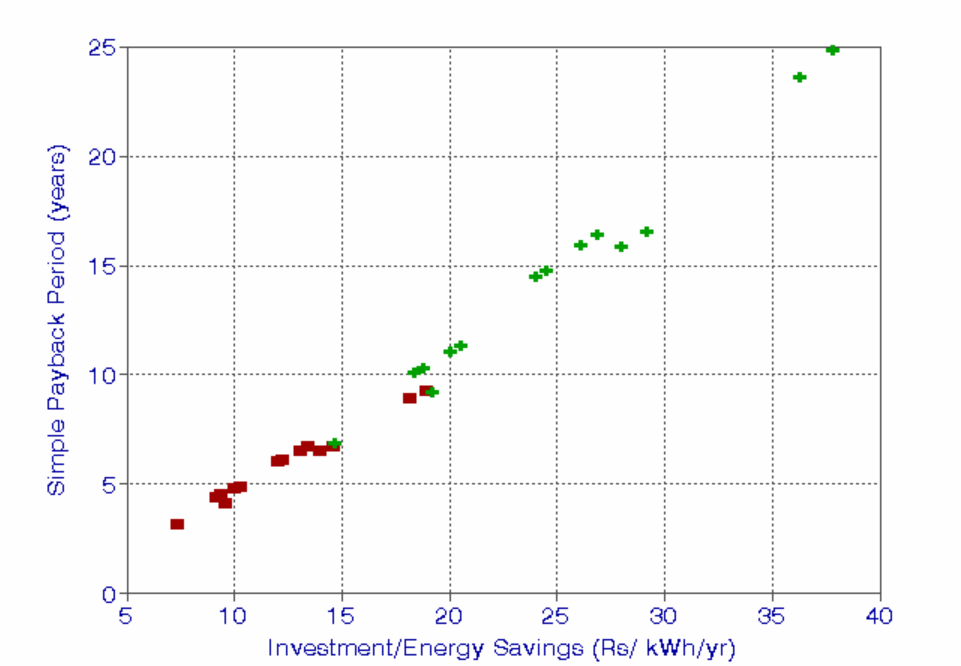
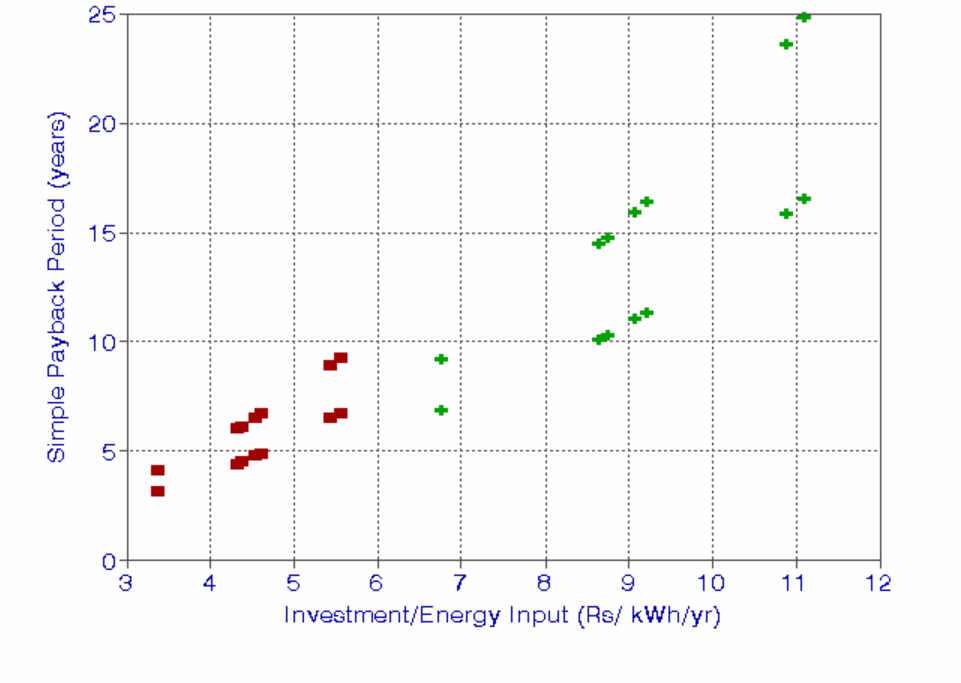


Exhibit VI-14: Rural Area Projects: Variation and Range of Payback Period vs. Investment per Energy Savings



While investment per energy savings varies between 4.8-14.7 Rs/ kWh/year saved for urban area projects, it varies between 7.3-37.8 Rs/ kWh/year saved for rural area projects, i.e. roughly about 2 times more. The simple payback period varies between 1.5-6.2 years for urban area projects, and between 3.1-24.8 years for rural area projects. It is also seen that the overall range of variation of these parameters for rural area projects is much more than for urban area projects. The range for investment per energy input and investment per energy savings is about 3-5 times, while for payback period, it is about 8 times.

For rural area projects, the lowest payback period is seen to be about 3 years. For most of the cases considered, the payback period is quite high and would be unacceptable. Only projects having investment per energy input less than around 5 Rs/ kWh/year input, or investment per energy savings less than around 15 Rs/ kWh/year saved would result in a payback period being less than 6-7 years, which may be considered reasonable.

Exhibit VI-15 shows the variation and the range of payback period corresponding to the energy savings per connected load expressed in terms of kWh/year of energy savings per kW of connected load. For rural area projects, energy savings per connected load varies between about 500-1400 kWh/year saved / kW connected load, compared to about 200-450 kWh/year saved / kW connected load for urban area projects, i.e. about 2.5-3 times more. This is the reason why while investment per energy input for rural area projects is roughly about 5 times more than for urban area projects, investment per energy savings is roughly only about 2 times more. However, despite the much higher energy savings per connected load, the revenue savings are much lower for rural area projects because of the low tariffs. Hence, the payback period is reasonable only for savings greater than about 1000 kWh/year saved / kW connected load.

The parameters and their ranges used for financial analysis are given in Exhibit VI-16. The construction period for rural area projects has been considered to be two years with partial savings beginning to accrue as partial implementation takes place and full savings being realized from the third year onwards. Accordingly, the moratorium for loan repayment has also been considered to be two years. The debt-equity ratio has been taken as 3, and interest rate on term loan between 8-14% with repayment period between 6-12 years.

Within the range of rural area projects, four cases have been selected and detailed financial analysis of these has been carried out. For these four cases, the payback periods are 3.1, 4.1, 4.9 and 6.0 years, and the project FIRRs are 37.5, 26.5, 20.7 and 15.3%.

Exhibit VI-15: Rural Area Projects: Variation and Range of Payback Period vs. Energy Savings per Connected Load

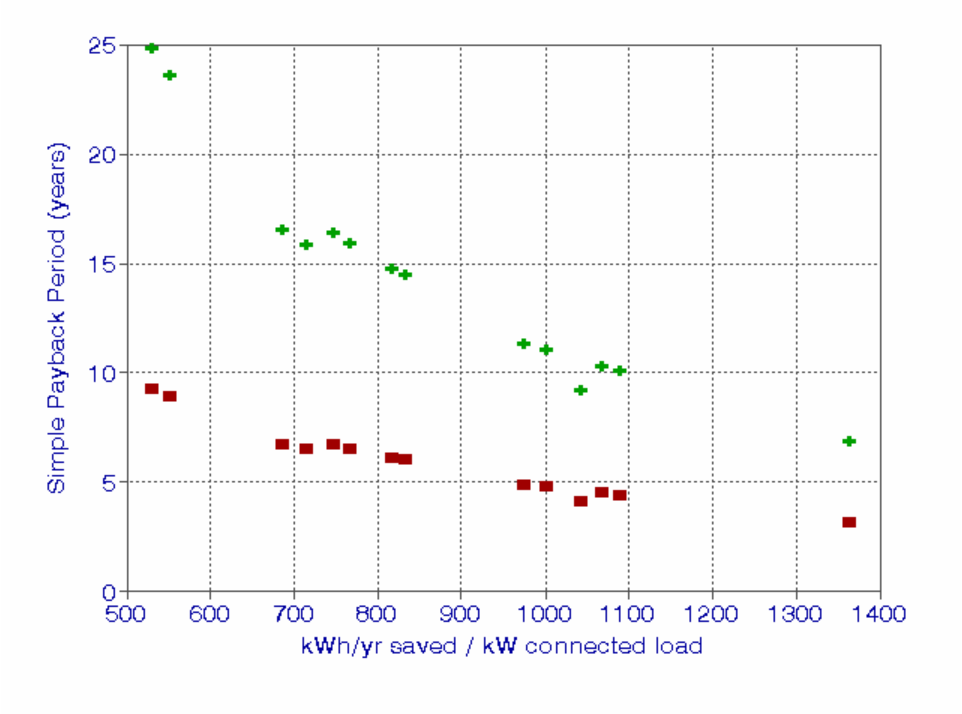


Exhibit VI-16: Rural Area Distribution System Improvement Analysis: Financial Analysis Parameters

Debt-Equity Ratio	3.0
Equity	25.0 %
Debt	75.0 %
Term Loan Interest Rate	8.0, 10.0, 12.0, 14.0 %
Repayment Period (incl. Moratorium)	6, 8, 10, 12 years
Loan Repayment Moratorium	2 years
Loan Installments Payment	Quarterly
Working Capital Loan Interest Rate	12.0 %
Depreciation Rate (Accounting, SLM)	7.84 %
Depreciation Rate (Income Tax, WDV)	25.0 %
Income Tax Rate	35.0 %
Salvage Value	10.0 %
Construction Period	2 years
Capital Expenditure Schedule	
Year 1	40.0 %
Year 2	60.0 %
Savings Level	
Year 1	20.0 %
Year 2	70.0 %
Year 3	100.0 %
Treatment of Loss	Carried Forward

For rural area projects, although the lowest payback period is seen to be 3.1 years, the payback periods are typically around 5-6 years for the best cases. As discussed for urban area projects, for projects having payback period of 5 years, repayment will be required over 12 years for a term loan at 14% interest, and for projects having payback period of 6 years, a term loan at 14% interest even with repayment over 12 years will not be serviceable. Hence, even the best rural area projects will require financing at lower interest rates and with longer repayment periods for them to be financially viable.

As shown in Exhibit VI-17, for the DSCR to be comfortable for such projects, financing at 8-10% interest with repayment over 12 years will be required for projects having payback period of 5 years, and financing at 8% interest with repayment over 12 years will be required for projects having payback period of 6 years. As shown in Exhibit VI-18, with an interest rate of 8%, the repayment periods can be shorter for projects having payback period of 3-4 years.

It should be noted however, that the above still is applicable only for the best cases. For rural area projects with longer payback periods, say up to 10 years, even longer repayment periods may become necessary. In such cases, amortization of assets over a longer period commensurate with their physical life of say 25-30 years, will need to be considered to enable coverage of debt service.

As mentioned above, it is assumed in this analysis that over the duration of the loan repayment period, the subsidy for agricultural consumption received by the utility from the state government is maintained at the original level. If the subsidy is reduced corresponding to the reduction in agricultural consumption, the payback period increases considerably. Even for the best cases, the repayment period would then need to be aligned with the physical life of the assets.

Considering the extremely wide variation in the case of rural area projects, some guidelines for the selection of pilot projects are suggested below. These relate to the investment, the energy savings and the revenue savings:

- As is seen from the above, the payback periods are reasonable only in cases where the investment in terms of Rs/ kW connected load is low. The investment required in a particular project will depend on the spread of the distribution system network and on its condition. The denser the distribution system with respect to the connected load (km of HT/LT lines/ kW connected load), the more the likelihood of investment cost being relatively low.

Exhibit VI-17: Rural Area Projects: Variation of DSCR vs. Payback Period for Project Financing for 12 years at Interest Rate from 8 to 14%

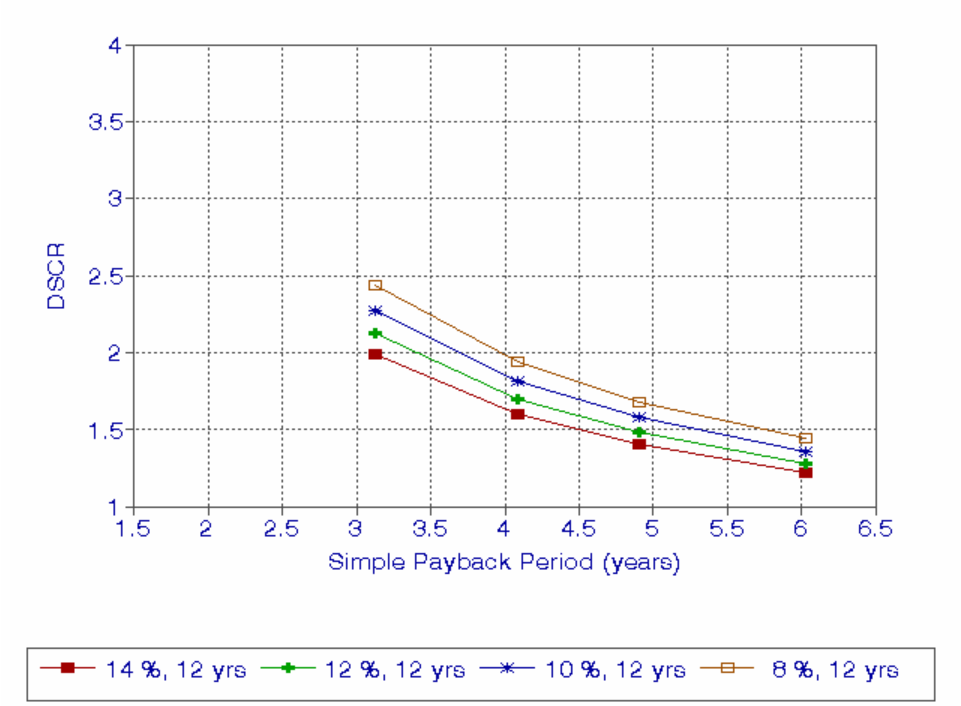
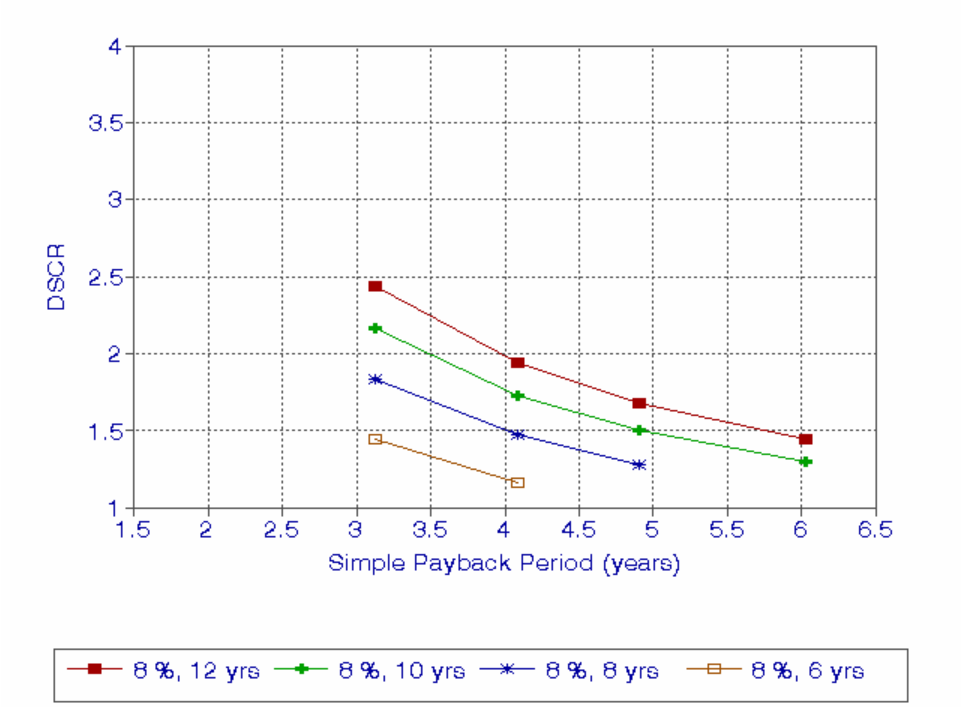


Exhibit VI-18: Rural Area Projects: Variation of DSCR vs. Payback Period for Project Financing for 12 years at Interest Rate from 8 to 14%



- As also seen from the above, the payback periods are reasonable only in cases where the energy savings per connected load of kWh/year saved / kW connected load is high. The kWh/year saved will typically be high only if the kWh/year consumed is high to begin with, i.e. the load factor should be high. This would be so in situations where the share of agricultural consumption is high (or conversely, where the share of domestic consumption is low), and where pump set usage (hours/year) is high. Thus areas where the cropping pattern is water intensive, and areas where surface irrigation is less would be areas that would be more attractive. Further, the higher the inefficiency of the pump sets population, higher will be the savings from agricultural DSM.

- Ultimately, it is the revenue savings that are important. In the case of rural area projects, the contribution of increase in billed consumption to the revenue savings is small and may even be negative. Thus, the revenue savings are essentially the savings due to avoided purchase of power. The higher the cost at which this energy is purchased, the higher will be the revenue savings. It should be noted that the term "avoided purchase" is with respect to the project. To the extent that this energy can be

redirected elsewhere by the utility to other higher paying consumers such as industry, the revenue savings may be even higher.

- Even with a decrease or no increase in billed consumption, revenue savings can also be obtained through an increase in tariff, which could be argued for as a quid-pro-quo measure for improvement in the availability, reliability and quality of power obtained as a result of the distribution system improvements. Even where there is a likelihood of this becoming possible some time after the implementation of the project, this would be important for the financial viability of the project considering the long duration of the repayment period.

ANNEX VII: POTENTIAL PARTNER INSTITUTIONS

The distribution reform problem in India offers USAID a unique opportunity to partner with a large number of public and private sector partners at the Center and state levels.

1. Potential Component 1 Partners

The potential partners as part of Component 1: DR Strategy and Financing will include the following:

The Ministry of Power and Other Central Power Entities:

The GoI's Ministry of Power has overall policy and strategic planning responsibility for the development and growth of the power sector. The MoP has recognized that, owing to past neglect and low investments, the country's distribution system is weak and as a corollary, T&D losses have assumed gigantic proportions making the entire sector financially unviable. In a major shift from its earlier emphasis in the nineties aimed at augmentation of generation capacity, the MoP views distribution as the weakest link and hence requiring the greatest attention. It strongly advocates that any strategy to reform the power sector has to primarily focus on the distribution sector in order to ensure positive cash flows needed to make the sector creditworthy. Given that power is a concurrent subject under the Indian constitution, the States have a greater share of generation and transmission assets and almost the entire distribution sector under their control and exclusive responsibility. Distribution projects, therefore, call for a greater degree of mutual understanding and coordination between the Center and the States. This is an important consideration in the project design that must ensure that USAID presence and partnerships reinforce central policy directed at advancing distribution reforms in reform-minded states.

The office of the Joint Secretary (Distribution Reforms) in MoP is responsible for the design, planning and implementation of centrally financed projects. A key program currently under implementation is the APDRP program introduced in early 2000 aimed at financing specific projects related to rehabilitation and modernization of the country's sub-transmission and distribution network. Under the APDRP program, Rs. 1000 crores ($200 million) was allocated to various states in 2000-01. This was stepped up to Rs. 1500 crores ($300 million) in 2001-02 for investment in 63 previously identified distribution circles and an additional Rs. 3500 crores has been allotted in 2002-03. These amounts, which are likely to increase in subsequent years, will be released to states as additional Central Plan assistance.

The goals of the APDRP program are consistent with the with the opportunity for leveraging potential USAID financial support to undertake system distribution improvements, introduce commercial practices, reduce T&D losses, improve revenue collection, reduce subsidies, and prepare the ground work for

distribution privatization. The APDRP Cell in the MoP will be a key partner for the implementation of Component 1 and shall also be a major beneficiary in terms of receiving USAID TA and training. This capacity building effort will be extended through the APDRP Cell to the NTPC and PGCI, which are the lead consultants to the MoP in the implementation of the APDRP program. Both NTPC and PGCI are responsible for program oversight and planning, and currently work through a network of public sector/government institutions, namely WAPCOS, CPRI, NPC, MECON, which have been designated as Advisors-cum-Consultants (AcCs). The AcC's have been allotted circles they are responsible for and are involved in conducting surveys, estimating investment needs and projecting T&D savings. USAID assistance to the lead partners institutions and to the AcC's would include, but not be limited to, enhancing their institutional capacity to (i) advance data collection and analysis up to 11 kV; (ii) prepare detailed project reports which would include financial cash flow statements; (iii) introducing effective monitoring and verification; and (iv) GIS mapping, and other related areas.

Public and Private Sector Financial Institutions

The project proposes lending mechanisms through the development of two channels of funding with the PFC and the IDFC respectively. The project contemplates seed funding to leverage APDRP and other resources through PFC to finance urban distribution circle modernization. Similar seed funding is proposed for financing rural/semi-urban distribution circles through the IDFC. The lending instruments for the financing of distribution circles will comprise grants, equity investment, credit guarantees, subordinated debt or a combination of these instruments. Some of the significant features of the proposed lending mechanism will be:

- Lending from the FI (e.g. PFC, IDFC) will be based on the corporate strength of the borrower rather than reliance on third-party guarantees
- The term structure of the lending from the FI will be for terms to match the life of the asset, defined as the length of the time over which the asset will be paid for by the customers, or the term of the funding source
- The terms of the lending will require reporting and monitoring of the corporate operating and financing performance parameters
- Pricing or the interest rate on the loans will involve collecting a specific premium to collect the "value at risk" in the lending activity; and
- Risk mitigation measures will be specifically adhered to in the lending program

Power Finance Corporation (PFC)

The Power Finance Corporation, a financial Institution wholly owned by the Government of India, was established in 1986 dedicated to the development of the electric power sector in India. It is managed by a Board of Directors comprising a Chairman-cum-Managing Director, 3 full time Directors and part time Directors representing the Ministry of Power and Central Electricity Authority. The corporation's funding sources include equity and accumulated surpluses (Rs 3400 Crores), loans from Govt. of India, Domestic Market Borrowings (Rs. 3900 Crores) and External Market Borrowings (Rs. 2200 Crores). Certain of the corporation's borrowings from multilateral lending agencies (World Bank and the Asian Development Bank – Rs. 1500 Crores, as of 3/31/2000) are routed through the Government of India into PFC and finally to the borrowing entities.

The corporation provides full range of financial products (lease financing, bill discounting, working capital loans and guarantee services) to the domestic power industry for the full range of their operations (Renovation & Modernization of Power Plants, Energy Conservation Schemes, and System Improvements). The corporation also offers consulting/lender engineer services to the borrowers.

A vast proportion of the Corporation's lending activities are directed to the state-owned and state government sponsored entities. Private sector constitutes a very small portion of the Corporation's portfolio roaster. As of March 31, 2002, the corporation's loan portfolio stood at Rs. 13,300 Crores, funded mainly with (Rs. 8,237 Crores) unsecured loans, (Rs, 1080 Crores) secured loans and equity and retained surplus (Rs. 3,810 Crores).

PFC posted an impressive 19% growth in loan approvals to touch Rs. 7706 Crores during FY 2000-01. PFC reported a high Recovery Rate (of 99.5%) with no Non-Performing Assets in FY 2001. In the last five years, PFC reported an increase in Recovery Rate from 83% in 1994-95 to 99.5% in 2000-01,

Although not explicitly stated in any of its publications, the obligations of borrowers to PFC are implicitly guaranteed by the state (borrowing) governments. Likewise, PFC's obligations to its lenders (funding sources) are implicitly guaranteed by the Government of India (by virtue of the ownership of the corporation by Government of India). The sovereign backing on the funding and lending side explains the reliance of PFC on unsecured debt and the very high credit ratings it is offered by domestic rating agencies. The corporation's credit rating from international rating agencies (on its external private market borrowing), for obvious reasons, is at the rating of the sovereign debt rating of the Government of India.

Infrastructure Development Financial Corporation (IDFC)

The Infrastructure Development Financial Corporation was established in 1994 as a professional body to help mobilize and direct private capital to commercially viable infrastructure projects. IDFC's capital structure includes (i) Foreign Financial Institutions (40%), (ii) Domestic Financial Institutions (20%), (iii) and the GoI (40%). IDFC's experience in financing power sector projects, primarily IPPs has been mixed. IDFC has now recognized decentralized infrastructure such as the "last mile" power distribution and distributed generation systems as an area of significant potential impact and returns. It has established a business unit called Decentralized Infrastructure & New Technologies (DINT), which operates on the economic point of view that the cost of providing "the last mile access" in infrastructure remains the most expensive and difficult aspect of infrastructure development. IDFC believes that DINT could offer a vehicle to provide last mile access to good quality infrastructure while also stimulating local entrepreneurship and economic development. The last mile interventions for sustainable development in distribution reforms will include solutions aimed at providing quality power, reducing T&D losses and improving revenue collections from all consumers. Key programmatic steps in the DINT scheme involved include the following:

- Introducing commercial business principles and practices;
- Preparing MIS and IT-based solutions to monitor and verify program activities and results;
- Creating community based social and institutional structures;
- Establishing sound energy accounting and metering practices;
- Designing and implementing electrical, electro-mechanical and communication technologies for efficient LT power distribution
- Commercial energy loss reduction and improved end-use energy conversion;
- Developing alternative energy supply sources through distributed generation systems;
- Designing and implementing a performance contract based agricultural DSM program including management of electrical load demand and improvements in irrigation pump set efficiency; and
- Advancing understanding of the water/energy nexus through interventions such as in-farm water management, rain-water harvesting and water-shed management issues

IDFC recognizes that the planned USAID initiative is at the developmental stage with a commercial orientation and will not be readily amenable to project financing because of the risks involved. A key risk is the absence of community-based structures in India. It has, therefore, shown considerable interest in

partnering with USAID to reduce this and other risks through joint pre-development work in the following illustrative areas:

- Development of social and community based participatory models;
- Provision of policy advise to central and state governments and SERCs on DR regulatory reforms;
- Provision of TA and training to governments and to utilities on structuring DR investments;
- Identification and stimulation of development work on distribution and end-use efficiency technologies with a view to working through the issues of applicability and reliability;
- Creating financial intermediation capacity in IDFC and other local FIs and commercial banks;
- Developing frameworks and project financial packages with appropriate risk mitigation components suitable for DR projects; and
- Facilitating and financing showcase DR transactions and projects and their subsequent replication.

IDFC has set aside $2 million for a number of initiatives and preparatory work that could facilitate design work for a few pilot rural distribution projects. Two pilot projects have been identified in Karnataka and one project each in Rajasthan and AP. IDFC is also working on developing a rural power distribution strategy in Uttaranchal.

2. Potential Component 2 Partners

The interventions under Component 2: State Distribution Reform Planning will be at the state level as the state distribution companies (SEBs and Discoms) control virtually all of the power distribution in India. Potential partners for USAID as part of interventions under Component 2 would include a number of state level entities involved in the power sector. The principal partners would be the following:

State Ministries of Energy and Rural Development and SERCs

Most states have a Ministry of Energy and a Ministry of Rural Development. The Ministry of Energy has a direct oversight rule in establishing policy for the energy sector and has, therefore, a non-controlling supervisory responsibility over the SEBs and Discoms. The Ministry of Rural Development, although not traditionally involved, has a legitimate role to the extent rural development is linked to the availability of electricity in the rural areas. In recent years, a patron is emerging whereby the Ministries of Energy and the Ministries of Rural Development have begun to coordinate the rural development and rural electrification planning processes. In some cases the ministries have sponsored joint programs for training in the linkages between rural development and poverty

alleviation and rural electrification. Therefore these two ministries will be natural partners for USAID in designing interventions aimed at enhancing the overall institutional capacities of state level entities in areas directly relevant to power distribution. Some examples of the areas where USAID and these ministries could partner with each other include the following:

- Consumer education programs to educate both urban and rural consumers on the importance of energy efficiency, prompt bill payment, consumer complaint resolution and new distribution technologies

- Training of managers and planners at the SEBs, Discoms, and SERCs in a variety of areas that have statewide implications on both urban and rural power distribution. These areas may include metering, billing, and collections, project development, design, financing, and implementation, tariff development, regulations development for rural electric cooperatives and licensing procedures for franchises, etc.

- Other areas of engagement such as overall state planning and budgeting and allocations for distribution reform

One key area where the state governments may need well-defined engagement with USAID includes assistance to the states in defining their reform commitments to be included in their respective MoAs with the MoP. As part of this assistance, most states are also in need of technical assistance and training in designing reform monitoring, evaluation, and reporting, especially for projects funded under the APDRP scheme. Therefore, a specific USAID will need to design tailor-made interventions depending upon the extent to which reforms have already been introduced in those states where pilot projects are selected.

Another area, which has a direct impact on the success of distribution reform at the state level includes the strengthening of local institutions such as village electric committees, rural consumer groups, and local and rural energy planning organizations. Many States, including the more reformed States, have expressed the need of influencing the process of designing programs within the SEBs and Discoms for enhancing consumer education, local institutional capacity building, and social marketing and outreach at the local level. These activities are crucial to the success of any reform initiatives, as the consumer needs to be fully integrated into such a process.

Other potential state level partners may include key state institutions involved in the energy sector. These may include universities, not-for-profit organizations, local and international NGOs, industrial associations and consumer groups. Specific interventions with such potential partners will depend upon the pilot projects selected for development and implementation.

State Electricity Boards and Discoms

The SEBs and Discoms will be the most natural partners for USAID under any new USAID DR activity. The specific types of interventions with these categories of partners have already been defined earlier. The Institutional Contractors selected by USAID will need to closely work with the management of SEBs and Discoms in the states where the pilot projects are selected. In addition, during the implementation phase of the project, the Institutional Contractors will need to work in close partnership with the relevant SEB and Discom in a host of areas relative to EPC, monitoring and verification (M&V), evaluation, and analysis of project results. Another key area of interventions will be to provide assistance to the SEBs and Discoms in implementing commercial approaches in order to strengthen the financial reforms at the distribution circle level. Therefore partnerships with SEBs and Discoms will also involve technical assistance and training and the design of data bases, implementation of MAC systems for financial management, cash flow analysis, and collection improvement.

As part of the distribution reform process, many of the SEBs are going through restructuring and unbundling. During this transition period, expected to last several years, the states are faced with not only managing the transition but also simultaneously improving the performance of the utilities. Therefore, selection and implementation of the best prospect distribution reform projects at the distribution circle and feeder levels will pose many challenges. The SERCs, in most of the states, need considerable capacity building in regulation development that will foster and accelerate the reform process. Given this diverse agenda, the partnership between USAID and SEBs and Discoms will need to be strategically targeted to maximize distribution reform benefits. To this extent, USAID and the States, in partnership, will need to select those pilot projects that need fundamental criteria to provide maximum reform benefits. Some of these criteria may include the following:

- Pilot project size -- projects in distribution sectors located in high density urban areas with a relatively larger proportion of paying customers may be the best initial choices

- Projects that offer the best prospects for replication in the near term

- Projects that may enjoy political support and that meet the above two criteria

- Rural electricity distribution projects in those predominantly rural distribution circles that are slated for accelerated rural development and

have a demonstrative record of sustained development based on the past several years

- Projects in those distribution circles where distribution losses are very high and where the demand for reliable and higher quality electric power is expected to increase significantly as a result of any planned new developments (such as industrial development, new town development, etc.)

To the extent these and any other criteria will add to the desirability of selecting special pilot projects, USAID and the distribution utilities will need to closely work together in developing mutually acceptable rationale for selecting and designing pilot distribution projects for implementation under the APDRP and USAID funding.

Other State Level Institutions (e.g., SIRD)

As mentioned earlier, USAID will need to partner with other selected state level entities. One such key entity is the State Institute for Rural Development (SIRD). SIRDs are state level institutes linked to the national institute for rural development (NIRD). These SIRDs are very instrumental in providing targeted training in the rural sector and have well established institutional infrastructure and linkages that could be tapped for implementing appropriate training in the rural sector to the extent a specific training area justify advancement of the distribution reform process. Linkage with the SIRDs would most likely be very appropriate for any rural distribution pilot projects that are selected under the USAID, APDRP project.

In addition, there may be other state level private sector organizations involved in various aspects of power distribution that may be potentially useful partners. Examples include research and engineering institutes, product and equipment testing laboratories, institutes for setting standards, electrical contractors associations, etc. The Institutional Contractor will need to develop these partnerships and linkages on an as-needed basis.

3. Potential Component 3 Partners

The potential USAID partners under Component 3: Distribution Circle Pilot Project Replication and Outreach may include the following entities:

Distribution Circles

The key to improvement of the distribution business is to promote the commercial orientation of the sector operation. While privatization is the goal, recent experience in Orissa and elsewhere indicates that several practical problems in implementation necessitate adoption of a phased approach. Thus, the transition

phase from a government owned and operated distribution entity to a fully private run business involves parallel actions aimed at improving the distribution system. These actions are not alternatives to privatization but rather essential to improving the cash flow of the utility focus on enhancing operations, improving efficiency and increasing accountability. Within this premise there is the need to safeguard any tendency against pre-empting the privatization process or creating conditions that are difficult to overcome during the privatization process.

It is generally recognized that the State Electricity Boards, absent commercial orientation and incentive mechanisms, suffer from a lack of accountability. Also, over the years it has become increasingly difficult to precisely account for the impact each of the internal factors (such as operational losses, technical and commercial losses) have on the utility's financial performance. As a starting point there may be a need to develop systems that identify various leakage points and provide indicative figures of the losses that the SEBs incur as a result. Two alternative approaches could be considered – a top down approach that where all factors external to the operation of the SEBs (e.g. subsidies to farmers for free/low priced power) are eliminated; and a bottoms-up approach where the focus would be on identifying and eliminating the internal factors and then targeting the external factors over the longer term. A closer examination of the situation will indicate that the top-down approach is a virtual non-starter given the socio-political complexities and repercussions inherent in eliminating power tariff subsidies to the farm sector. This, therefore, leaves one with little option but to pursue the approach that is aimed at improving the distribution system at a level and size where management accountability coupled with responsibility, operational efficiency, and financial viability can be experimented, tested and validated. This approach is proposed to be introduced at the level of a distribution circle, or if need be, further disaggregated to the level of a substation or even feeders. The distribution circle has been also identified by the APDRP program as the administrative unit for the introduction of improved business management practices. Under any new USAID DR activity in India, the distribution circle will be a key partner and beneficiary.

Briefly, the distribution circle represents a defined and manageable area, approximately covering a district, which caters to all categories of consumers in that area and is responsible for the collection of revenue from its customers. A typical SEB may consist of about 20-30 distribution circles and is headed by a Superintendent Engineer who is supported by 2-4 Chief Engineers, several Executive Engineers, and Junior Engineers. Lower down are sub-station operators, electrical linesmen, meter readers, accountants and clerks.

The APDRP program plans to work with Distribution Circles and establish within each of them the concept of Distribution Profit Centers (DPC). The objectives of the DPC would include the following:

- Creation of responsibility centers within SEBs and thereby re-establish accountability within the organization;
- Delegate authority to line managers and establish a system of responsibility and accountability tied to improved technical and financial performance; and,
- Serve as a transitory system leading to eventual privatization of the distribution company;

The functions of the DPCs would include the following:

- Ensure improved quality, reliability and availability of supply;
- Introduce commercial and technical loss reduction measures and systems;
- Eliminate thefts and unauthorized connections;
- Implement electricity input, output, sales and financial accounting at the distribution circle, sub-station, 11 KV and distribution transformer levels;
- Efficient procurement, supply and inventory of spares and consumables;
- Plan and design distribution system utilizing innovative engineering approaches, standards and GIS protocols;
- Develop and install MIS systems, IT interface solutions to monitor and verify impact and results;
- Create community based social and institutional structures; and
- Provide customer care service to redress complaints

Non-Governmental organizations

A number of non-governmental organizations could also be strategically useful partners in not only project pilot design but also during the implementation phase. Many of the non-governmental organizations that may be suitable USAID partners for pilot projects in the urban sector have already been mentioned in the proceeding section, especially for distribution circle projects in the urban sector. Therefore, the discussion on potential partners in this section is focused on relevant institutions that are typically active in rural electricity distribution projects.

Rural Electric Cooperatives

Although there are some 30 rural electric cooperatives in the various states in India, only 14 of these cooperatives are currently active to varying degrees of successes. Given the magnitude of demand for rural electricity in India, in the current status of rural electric cooperatives, it is safe to conclude that the concept of rural electric cooperatives has not taken off in India. This is in direct contrast to the highly successful Bangladesh REB/PBS rural electrification model. A total of 67 PBSs are currently operating in Bangladesh and more than half of them are

successful and close to a dozen of them are generating surpluses. For the rural electrification system as a whole, these PBSs have achieved the overall system losses at a relatively low level of 8-14% and a revenue collection rate of 98%, an impressive performance by any standards. The MoP has expressed a strong interest in investigating the potential adaptability of the Bangladesh model to rural electrification in India. Also the Asian Development Bank is finalizing a $350 million loan package for the State of Madhya Pradesh. A component of this project will focus on rural distribution sectors and 11 kW and 33 kW feeder lines. The project will utilize the rural electric cooperative model to introduce distribution reforms at the rural level. For the urban sector, the ADB Project will utilize the corporate model. The rural component of the ADB Project will be in the Gwaliar area.

Another example for rural distribution reform interventions is the State of West Bengal. This state is in consultation with the REB in Bangladesh and is exploring the adaptability of the Bangladesh REB/PBS model for introducing rural electricity delivery and distribution reform throughout the State.

There are at least two options for the selection of a pilot rural distribution reform project. First, the project could be selected in a rural area where a rural electric cooperative is already operating. In this case, this cooperative will be the most logical USAID partner. Alternatively, USAID may select a rural single or multiple feeder project as a slice from a distribution circle with mixed urban and rural load. In this case, USAID may consider expanding the pilot project design to include the development and restructuring of a new rural electric cooperative embodying key components of successful rural electric cooperatives elsewhere, such as in Bangladesh.

While most of the rural electric cooperatives worldwide are consumer-owned cooperatives, there are a number of successful producer-owned cooperatives such as cooperatives owned by coffee growers in Peru, and those owned by sugar cane growers in a number of countries in Latin America and Africa. Therefore, if USAID were to design a rural distribution reform project that includes a new model for rural electricity delivery, it may be wise to also consider the desirability of a producer-owned rural electric cooperative model.

Clearly, these decisions will need to be made once a potential rural distribution project meets other basic criteria for selection such as the potential form wide-scale replication throughout India in other predominantly rural distribution circles.

Franchises

Another model worthy of consideration could be the introduction of franchises for the delivery of rural electricity in predominantly rural distribution circles. Under such a scheme, for example, the SEB or the Discom could open the rural electricity sector to potential franchises. This would be possible only if an

appropriate regulatory regime exists and the legal and regulatory provisions for franchises are well established. An excellent example of this model is a project being developed by EEEC in the State of Andhra and Pradesh. Under this project the EEEC has offered to the state government to take over a rural area and implement a distribution reform project as a franchise. The Team held extensive discussions with the project sponsors at EEEC. These discussions offer interesting clues to both the desirability of franchise systems as well as the complexities and impediments associated with designing and implementing rural distribution reform projects under the franchise model. Some of the key elements that would have an impact upon the ability of USAID to design and select rural distribution reform projects are summarized below:

- A general lack of data at the feeder and substation levels
- A poor equipment and line condition and a general lack of poor maintenance of the system
- A mix of both legal and illegal customers coupled with an inability to separate the two
- The need for GAS mapping to pinpoint areas with the worst condition
- Poor engineering and construction as a result of intense and ad-hoc electrification and wide-scale political influence

Essentially, the EEEC's proposal is to take over an existing 11 kW feeder line from the utility to a specific area dominated by the farming community as a billed-owned-operate (BOO) franchise. The government response to EEEC is to design a larger project, perhaps at the substation level, that may include several feeders. On of the key findings of this EEEC experience is the upfront cost associated with project design, engineering, and financing and the high level of downstream risks associated with the rural sector, where cost recovery is a major problem. In order to address both of these problems, EEEC is in need of initial grant funding to partially offset its upfront project development costs. Therefore, if all other criteria are satisfactory, this project may offer USAID an opportunity to provide partial funding in order to increase the desirability of the project for development and financing.

With the respect to financing the project under this franchise scheme, EEEC would need non-recourse financing from a financial institution that offers below market rates with long-term project financing. EEEC is in discussion with IDFC to seek financing for this project, which is estimated to require a total investment of $15 million with some initial equity investment by the franchise. Another component that complicates financing of such rural electric franchises is a lack of availability of insurances and guarantees to reduce project risks. This offers USAID another area of strategic interventions, one option would be for USAID to

offer an investment guarantee sufficient to change the debt/equity mix of the project, thereby reducing the project risk and facilitating implementation.

This example clearly illustrates how different rural electrification reform is from urban reform and also mandates that any USAID intervention designed for rural electricity distribution reform should be tailor-made with explicit incorporation of ground conditions of rural electrification and based on a lack of institutional infrastructure at the rural level for implementing rural electrification reform projects.

Village Electric Committees (VECs)

Other potential partners at the rural level could include Village Electric Committees (VECs) that play an important rule in being excellent linkages between the distribution utility or the rural electricity provider and the rural consumer. Many of these states in India have village electric committees and once USAID has selected candidate rural distribution reform projects, an appropriate level of engagement with these committees will be crucial. Such an engagement will have a great impact upon the overall success of the selected pilot project. In addition, if designed carefully, this approach will also offer other tangential and important benefits such as capacity building of the committees, greater project credibility, increased consumer confidence through direct consumer participation and a higher potential for replication.

The VECs would be comprised of representatives of various users. There may be one VEC for users serviced from the same transformer or one VEC for a village or one VEC for a cluster of villages or one VEC for the entire franchisee area. The optimal size would depend on the local requirement for effectiveness. The key functions of the VEC would include the following:

- Communication program implementation/Mobilization of community support
- Benefits from the initiative to the rural users
- Encouragement for metering
- Tariff acceptance & payment of bills
- Theft prevention
- Encouragement for DSM and water management
- Disconnection decisions

NGOs

Non-governmental organizations (NGOs) have proven to be one of the best channels to bridge a gap between rural electric utilities and the consumer. Experience worldwide confirms that effective NGOs can be great partners with the donor community increasing rural electrification. Some of the more successful NGO organizations active in the rural electrification area include

NRECA, Winrock International, ATDG, etc. Typically, NGOs can play a variety of roles and operate under different institutional structures. In some cases, particularly in distributed generation, the NGOs can actually take the role of electricity providers to the rural consumers. In other cases NGOs can design and develop small-scale rural electrification projects. And, in many instances, NGOs can play a strategic role to strengthen the institutional infrastructure at the village level, which is generally weak, and is often the major source of risks associated with rural electrification projects.

If the partnership with an NGO is carefully designed, it cannot only meet the critical linkage between electricity provider and the consumer, but also a significant transparency, accountability, and credibility to the rural electrification distribution process.